Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **1**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x+3|+2x \le -2 \\ x^2-2x+1 > 1-3x. \end{cases}$$

Answer: A $-3 < x \le -\frac{5}{3}$ B $-3 < x \le -\frac{2}{3}$ C No x D $x \ge \frac{5}{3}$ E $x \le -\frac{5}{3}$ → **E**

2) Compute all solutions of the inequality $2x^2+|-x-2| \ge -3x+4$.

Answer: A $-\frac{3}{2} \le x \le \frac{1}{4}\left(1+\sqrt{33}\right)$ B $x \le -1$ or $x \ge \sqrt{2}$ C $x \le \frac{1}{2}\left(-1-\sqrt{13}\right)$ or $x \ge \sqrt{2}-1$ D $-1 \le x \le 0$ E $x \le \frac{1}{4}\left(-1-\sqrt{17}\right)$ or $x \ge \frac{1}{4}\left(\sqrt{41}-5\right)$ → **C**

3) Compute the limit $\lim_{x\to 0-} -\dfrac{e^{5x}-\cos(x)}{3x}$.

Answer: A $-\frac{5}{3}$ B 1 C -1 D Does not exist E $\frac{5}{3}$ F $-\frac{5}{9}$ → **A**

4) Compute the limit $\lim_{x\to 0-} \dfrac{\log(1-3x)}{\sin(x)}$.

Answer: A 1 B -3 C Does not exist D -1 E $\frac{5}{3}$ F 5 → **B**

5) Compute the value $f'(0)$ of the derivative in $x=0$ for the function

$$f(x) = \exp\left(\frac{-x+1}{4x+1}\right).$$

Answer: A 1 B $\frac{4}{e^2}$ C $\frac{5}{e}$ D $-9e^2$ E $-5e$ → **E**

6) Find the domain of definition of the function

$$f(x) = e^{2x+\frac{1}{-2x-1}+1}.$$

Answer: A $x \ne -\frac{1}{2}$ B $x \ne -\frac{1}{5}$ C $x \ne \frac{1}{5}$ D $x \ne \frac{7}{9}$ E $x \ne -\frac{2}{9}$ → **A**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: A $-\infty$ B 0 C -1 D 1 E $+\infty$ → **E**

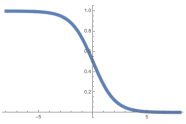
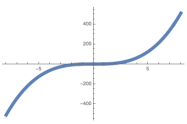
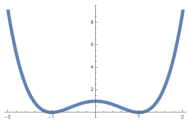
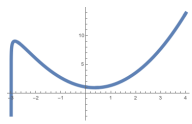
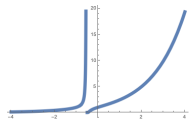
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x=0$.

Answer: A $-2e^{9/4}$ B $-\frac{3}{2e^{5/2}}$ C 4 D $2e^{8/3}$ E 1 → **C**

9) Which are the points of minimum of $f(x)$?

Answer: A $x=-\frac{3}{2}$ B $x=\frac{1}{2}\left(1-\sqrt{2}\right)$ C $x=0$ D $x=1$ E Noo → **E**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **E**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **2**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} x - 2 \leq x - 2x^2 \\ 2x - 3 > |1 - 2x| \, . \end{cases}$$

Answer: A $x > 4$ B $0 < x \leq \frac{1}{2}\left(\sqrt{5} - 1\right)$ C $x > 0$ D No x E $x > -\frac{1}{3}$ → **D**

2) Compute all solutions of the inequality $2\,|x - 1| - 3x + 1 \leq x^2$.

Answer: A $\frac{1}{2}\left(-1 - \sqrt{13}\right) \leq x \leq \frac{1}{2}\left(3 + \sqrt{5}\right)$ B $x \leq -\frac{4}{3}$ or $x \geq 0$ C All $\mathbf{R}$ D $\frac{1}{2}\left(3 - \sqrt{21}\right) \leq x \leq \frac{1}{2}\left(3 + \sqrt{21}\right)$ → **E**
E $x \leq \frac{1}{2}\left(-5 - \sqrt{37}\right)$ or $x \geq \frac{1}{2}\left(\sqrt{37} - 5\right)$

3) Compute the limit $\lim_{x \to 0-} -\dfrac{e^x - \cos(3x)}{9x}$.

Answer: A $\frac{5}{9}$ B $-\frac{1}{9}$ C $-\frac{1}{3}$ D $\frac{5}{3}$ E $\frac{1}{9}$ F Does not exist → **B**

4) Compute the limit $\lim_{x \to 0} \dfrac{\sin\left(x^2 + 2x\right)}{7x - 2x^3}$.

Answer: A $\frac{1}{3}$ B $\frac{1}{7}$ C $\frac{2}{5}$ D $\frac{2}{3}$ E Does not exist F $\frac{2}{7}$ → **F**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \exp\left(\frac{-x - 2}{4x + 1}\right).$$

Answer: A $-e$ B -1 C $\frac{4}{e^2}$ D $-6e^2$ E $\frac{7}{e^2}$ → **E**

6) Find the domain of definition of the function

$$f(x) = 2\log\left(x^2 + x + 2\right).$$

Answer: A $\frac{1}{2}\left(-3 - \sqrt{13}\right) < x < \frac{1}{2}\left(\sqrt{13} - 3\right)$ B $x > 0$ C All $\mathbb{R}$ D $x \neq 1$ E $x < 0$ → **C**

7) Compute the limit as $x \to -\infty$ of $f(x)$.

Answer: A -1 B 0 C $-\infty$ D $+\infty$ E 1 → **D**

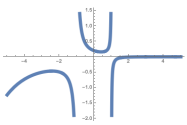
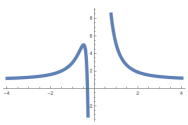
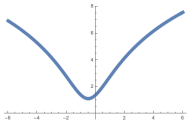
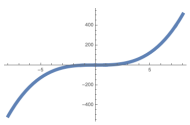
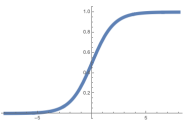
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $-\frac{2}{3}$ B 1 C 3 D 2 E $\frac{2}{3}$ → **B**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = -\frac{1}{6}$ B $x = \frac{1}{2}$ C $x = 2$ D $x = -\frac{1}{2}$ E $x = 1$ → **D**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **C**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **3**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x+1| - 2x \leq 1 \\ x^2 - 2x + 2 > x + 2. \end{cases}$$

Answer: [A] $0 < x < 1$ [B] $x > 3$ [C] $-3 < x \leq -2$ [D] $-3 < x \leq -1$ [E] $x > 0$ →**B**

2) Compute all solutions of the inequality $-3|x+1| - 3x + 1 > -x^2$.

Answer: [A] $x < \frac{1}{6}\left(-3 - \sqrt{21}\right)$ or $x > \frac{1}{6}\left(1 + \sqrt{61}\right)$ [B] $\frac{1}{2}\left(-1 - \sqrt{13}\right) < x < \frac{1}{2}\left(\sqrt{21} - 5\right)$ [C] $x < 3 - \sqrt{11}$ or $x > 3 + \sqrt{11}$ [D] $\frac{1}{2}\left(-5 - \sqrt{13}\right) < x < \frac{1}{2}\left(\sqrt{5} - 1\right)$ [E] $x < \frac{1}{3}\left(1 - \sqrt{7}\right)$ or $x > \frac{1}{3}\left(1 + \sqrt{7}\right)$ →**C**

3) Compute the limit $\lim_{x \to 0-} -\dfrac{e^{3x-x^2} - 1}{9x}$.

Answer: [A] Does not exist [B] $\frac{1}{3}$ [C] 1 [D] $\frac{1}{9}$ [E] -1 [F] $-\frac{1}{3}$ →**F**

4) Compute the limit $\lim_{x \to 0} \dfrac{\log(5x+1)}{x^2 + x}$.

Answer: [A] 3 [B] Does not exist [C] 1 [D] -3 [E] $\frac{5}{3}$ [F] 5 →**F**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \frac{\sin(-2x)}{3x^2 + 1}.$$

Answer: [A] -2 [B] $-\frac{1}{2}$ [C] $\frac{1}{2}$ [D] 1 [E] $-\frac{1}{3}$ →**A**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{-2x}}{2x^2 + x + 1}.$$

Answer: [A] All $\mathbb{R}$ [B] $x \neq 0$ [C] $x \neq -1 - \sqrt{2}$ and $x \neq \sqrt{2} - 1$ [D] $x \neq -1$ [E] $x \neq \frac{1}{2}\left(1 - \sqrt{5}\right)$ and $x \neq \frac{1}{2}\left(1 + \sqrt{5}\right)$ →**A**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: [A] $-\infty$ [B] $-\frac{1}{2}$ [C] $\frac{1}{3}$ [D] $-\frac{1}{3}$ [E] 0 →**E**

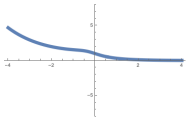
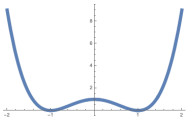
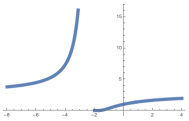
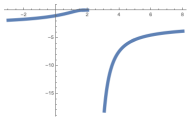
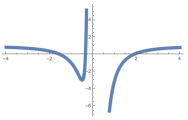
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] $\frac{1}{5}$ [B] $\frac{7}{8}$ [C] $\frac{1}{7}$ [D] -3 [E] $\frac{1}{3}$ →**D**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = -\frac{5}{2}$ [B] $x = -\frac{2}{3}$ [C] $x = -1$ [D] $x = \frac{1}{2}\left(1 - \sqrt{7}\right)$ [E] Noo →**E**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  →**A**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **4**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x+3| + 2x \leq 1 \\ -x^2 - 2x + 2 > x + 2. \end{cases}$$

Answer: A $x \leq -2$ B $3 \leq x < 4$ C $-3 < x \leq -\frac{2}{3}$ D $0 < x < 1$ E $x > 3$ → **C**

2) Compute all solutions of the inequality $-2\,|x+1| - 3x + 1 \leq -x^2$.

Answer: A $x \leq \frac{1}{2}\left(-3 - \sqrt{13}\right)$ or $x \geq \frac{1}{2}\left(\sqrt{13} - 3\right)$ B $x \leq \frac{1}{6}\left(1 - \sqrt{37}\right)$ or $x \geq \frac{1}{6}\left(1 + \sqrt{37}\right)$ C $x \leq -2$ or $x \geq \sqrt{2} - 2$ D $\frac{1}{2}\left(5 - \sqrt{29}\right) \leq x \leq \frac{1}{2}\left(5 + \sqrt{29}\right)$ E $\frac{1}{2}\left(1 - \sqrt{21}\right) \leq x \leq \frac{1}{2}\left(\sqrt{13} - 3\right)$ → **D**

3) Compute the limit $\lim_{x \to 0+} \dfrac{\sin(3x)}{e^{3x} - 1}$.

Answer: A 1 B Does not exist C 5 D $-\frac{5}{3}$ E $\frac{5}{3}$ F 3 → **A**

4) Compute the limit $\lim_{x \to 0} \dfrac{\sin\left(x^2 + 2x\right)}{x^3 + 3x}$.

Answer: A Does not exist B $\frac{1}{5}$ C $\frac{2}{3}$ D $\frac{1}{3}$ E $\frac{2}{5}$ F $\frac{1}{7}$ → **C**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \left(x^2 - 1\right) \sin\left(2x + \frac{\pi}{2}\right).$$

Answer: A -1 B 0 C -2 D 2 E 1 → **B**

6) Find the domain of definition of the function

$$f(x) = (x+1)e^{2 - 2\arctan(x)}.$$

Answer: A $x \neq 0$ B All $\mathbb{R}$ C $-\pi < x < \pi$ D $x \geq -\pi$ E $x > -\pi$ → **B**

7) Compute the limit as $x \to -\infty$ of $f(x)$.

Answer: A $\frac{\pi}{3}$ B $-\pi$ C 1 D $+\infty$ E $-\infty$ → **E**

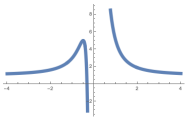
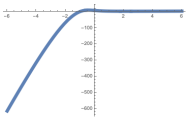
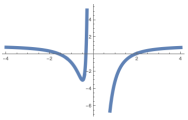
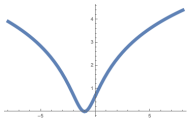
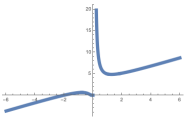
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $3e^2$ B $-4e$ C $\frac{3}{e}$ D $-e^2$ E e → **D**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = -2$ B $x = 1 + \sqrt{2}$ C $x = 1 - \sqrt{2}$ D $x = 1$ E Noo → **B**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **B**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **5**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |1-x| - 2x \leq 1 \\ x^2 + x + 1 > x + 1. \end{cases}$$

Answer: [A] $x \leq -\frac{5}{3}$ [B] $1 \leq x < 4$ [C] $3 \leq x < 4$ [D] $x > 0$ [E] $x \leq -5$ →**D**

2) Compute all solutions of the inequality $-2\,|x-3| + x - 3 > -3x^2$.

Answer: [A] $x < \frac{1}{2}\left(-1 - \sqrt{13}\right)$ or $x > \frac{1}{2}\left(\sqrt{13} - 1\right)$ [B] $x < \frac{1}{6}\left(3 - \sqrt{21}\right)$ or $x > \frac{1}{6}\left(3 + \sqrt{21}\right)$ [C] $x < -5$ →**A**
[D] $x < -1 - \sqrt{6}$ or $x > \sqrt{6} - 1$ [E] $x < -3$

3) Compute the limit $\lim_{x \to 0} -\dfrac{e^{3x^2+x} - 1}{9x}$.

Answer: [A] 1 [B] $-\frac{1}{9}$ [C] $\frac{1}{9}$ [D] Does not exist [E] -1 [F] $\frac{1}{3}$ →**B**

4) Compute the limit $\lim_{x \to 0-} \dfrac{x^3 + x^2}{1 - \cos(5x)}$.

Answer: [A] 4 [B] Does not exist [C] 2 [D] $\frac{2}{49}$ [E] $\frac{4}{25}$ [F] $\frac{2}{25}$ →**F**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = -\cos\left(x \exp(2x) - \frac{\pi}{2}\right).$$

Answer: [A] 2 [B] 4 [C] -1 [D] -4 [E] 0 →**C**

6) Find the domain of definition of the function

$$f(x) = \frac{2x^2 + x + 1}{x - 1}.$$

Answer: [A] All $\mathbb{R}$ [B] $x \neq \frac{1}{3}$ [C] $x > 0$ [D] $x \neq 1$ [E] $x \geq 0$ →**D**

7) Compute the limit as $x \to 1-$ of $f(x)$.

Answer: [A] -1 [B] 1 [C] $+\infty$ [D] 0 [E] $-\infty$ →**E**

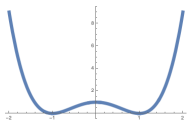
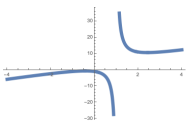
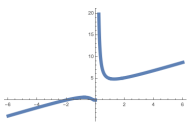
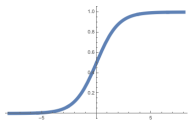
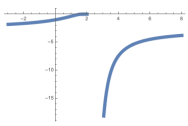
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] -1 [B] -3 [C] 4 [D] $\frac{3}{4}$ [E] -2 →**E**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = 1 + \sqrt{2}$ [B] $x = \frac{1}{3}\left(-1 - \sqrt{7}\right)$ [C] $x = \frac{1}{2}\left(2 + \sqrt{6}\right)$ [D] $x = \frac{1}{6}\left(2 + \sqrt{22}\right)$ [E] $x = 0$ →**A**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  →**B**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **6**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |-x-1| > -2x-2 \\ 2x > x^2+x-2. \end{cases}$$

Answer: [A] $x<-1$ or $0<x<5$ [B] $x<3$ [C] $-1<x<2$ [D] $\frac{1}{2}\left(3-\sqrt{5}\right)<x<1$ [E] $x>2$ →**C**

2) Compute all solutions of the inequality $-2\,|x+1|-3x-3\le 2x^2$.

Answer: [A] $x\le\frac{1}{6}\left(3-\sqrt{21}\right)$ or $x\ge\frac{1}{6}\left(3+\sqrt{21}\right)$ [B] All $\mathbf{R}$ [C] $x\le -1$ or $x\ge 1$ [D] $x\le -\frac{2}{\sqrt{3}}$ or $x\ge\frac{1}{3}\left(\sqrt{3}-3\right)$ [E] $x\le\frac{1}{2}\left(-5-\sqrt{21}\right)$ or $x\ge\frac{1}{2}\left(\sqrt{13}-1\right)$ →**B**

3) Compute the limit $\lim_{x\to 0+}\dfrac{e^{5x}-\cos(3x)}{9x}$.

Answer: [A] $\frac{1}{9}$ [B] $-\frac{5}{9}$ [C] Does not exist [D] $\frac{1}{3}$ [E] 1 [F] $\frac{5}{9}$ →**F**

4) Compute the limit $\lim_{x\to 0+}-\dfrac{\log(x+1)}{\sin(3x)}$.

Answer: [A] 1 [B] -3 [C] 3 [D] $-\frac{1}{3}$ [E] -5 [F] Does not exist →**D**

5) Compute the value $f'(0)$ of the derivative in $x=0$ for the function

$$f(x)=\frac{x\cos(3x)}{3x+3}.$$

Answer: [A] $-\frac{1}{3}$ [B] $\frac{1}{2}$ [C] $\frac{1}{3}$ [D] 0 [E] 1 →**C**

6) Find the domain of definition of the function

$$f(x)=2x+\log\left(\frac{x+2}{-x-3}\right).$$

Answer: [A] $-3<x<2$ [B] $-2<x<\frac{3}{2}$ [C] $-3<x<-2$ [D] $x<\frac{1}{2}$ or $x>2$ [E] $x>-\frac{1}{2}$ →**C**

7) Compute the limit as $x\to-\infty$ of $f(x)$.

Answer: [A] 4 [B] Does not exist [C] 2 [D] $-\infty$ [E] $\frac{1}{2}$ →**B**

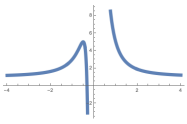
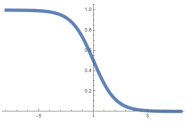
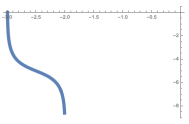
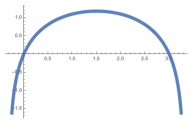
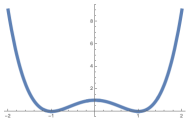
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x=0$.

Answer: [A] $-\frac{12}{11}$ [B] $-\frac{30}{11}$ [C] $\frac{4}{3}$ [D] $\frac{13}{6}$ [E] $\frac{3}{5}$ →**D**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x=\frac{1}{2}\left(-1-\sqrt{15}\right)$ [B] $x=\frac{1}{4}\left(3\sqrt{5}-3\right)$ [C] $x=1+\sqrt{6}$ [D] Noo [E] $x=\frac{1}{2}\left(5+\sqrt{3}\right)$ →**D**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  →**C**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **7**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |-x-1| > 1-2x \\ x > x^2 + x. \end{cases}$$

Answer: A $-2 < x < -\frac{1}{3}$ or $x > 0$ B $x > -5$ C $-1 < x < 0$ D No x E $-\sqrt{2} < x < 1$ → **D**

2) Compute all solutions of the inequality $-2\,|x-1| - 3x + 1 > -x^2$.

Answer: A $x < -\frac{2}{3}$ or $x > 0$ B $x < -2-\sqrt{6}$ or $x > \sqrt{6}-2$ C $x < 0$ or $x > \sqrt{2}$ D $x < 1-\sqrt{3}$ or $x > 2$ E $x < \frac{1}{2}\left(1-\sqrt{5}\right)$ or $x > \frac{1}{2}\left(5+\sqrt{13}\right)$ → **E**

3) Compute the limit $\lim_{x\to 0+} -\dfrac{e^{x-x^2}-1}{3x}$.

Answer: A $\frac{1}{9}$ B -1 C $-\frac{1}{3}$ D $-\frac{1}{9}$ E Does not exist F $\frac{1}{3}$ → **C**

4) Compute the limit $\lim_{x\to 0+} -\dfrac{\log(1-3x)}{\sin(3x)}$.

Answer: A 1 B 3 C -5 D Does not exist E -3 F $-\frac{5}{3}$ → **A**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = 2x \log\left(3x^2 + 2x + 3\right).$$

Answer: A 0 B $\log(3)$ C $2\log(2)$ D $2\log(3)$ E $\log(2)$ → **D**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{x^2-2x+1}}{x}.$$

Answer: A All $\mathbb{R}$ B $x \le 0$ C $x \neq -\frac{1}{3}$ D $x > 0$ E $x \neq 0$ → **E**

7) Compute the limit as $x \to 0$ of $f(x)$.

Answer: A Does not exist B -1 C 1 D 0 E $-\infty$ → **A**

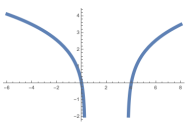
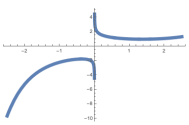
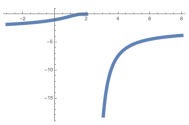
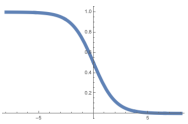
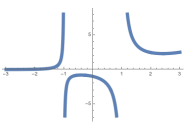
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A Non definita B $5e$ C $-3e$ D e E $2e$ → **A**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = \frac{1}{2}\left(-1-\sqrt{3}\right)$ B $x = \frac{1}{2}\left(\sqrt{3}-1\right)$ C $x = \frac{1}{2}\left(1+\sqrt{3}\right)$ D $x = -1$ E Noo → **C**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **B**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **8**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} 2x^2 + x - 2 < -2x^2 \\ x \geq |1 - 2x| - 1. \end{cases}$$

Answer: A $0 \leq x < \frac{1}{8}\left(\sqrt{33} - 1\right)$ B $0 \leq x < \frac{1}{8}\left(\sqrt{41} - 3\right)$ C $-2 \leq x \leq 0$ D No x E $0 \leq x < 1$ → **A**

2) Compute all solutions of the inequality $-2\,|x - 1| + x - 3 \leq -x^2$.

Answer: A $-\sqrt{3}$ B $-\sqrt{2} \leq x \leq 2$ C $\frac{1}{2}\left(-3 - \sqrt{29}\right) \leq x \leq \frac{1}{2}\left(1 + \sqrt{5}\right)$ D $0 \leq x \leq \sqrt{2}$ E $x \leq \frac{1}{4}\left(-3 - \sqrt{33}\right)$ or $x \geq \frac{1}{4}\left(\sqrt{33} - 3\right)$ → **C**

3) Compute the limit $\lim_{x \to 0} -\dfrac{\sin(5x)}{e^{-3x} - 1}$.

Answer: A -3 B $\frac{5}{3}$ C -1 D -5 E 5 F Does not exist → **B**

4) Compute the limit $\lim_{x \to 0-} \dfrac{\sin\left(x - x^2\right)}{3x - 2x^3}$.

Answer: A $\frac{2}{3}$ B $\frac{1}{5}$ C $\frac{1}{7}$ D $\frac{1}{3}$ E Does not exist F $\frac{2}{7}$ → **D**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \frac{\sin(-x)}{x^2 + 3}.$$

Answer: A $-\frac{1}{3}$ B $\frac{2}{3}$ C 0 D $\frac{1}{2}$ E -1 → **A**

6) Find the domain of definition of the function

$$f(x) = e^{x + \frac{1}{x+1} - 2}.$$

Answer: A $x \neq -1$ B $x \neq \frac{7}{8}$ C $x \neq -\frac{3}{7}$ D $x \neq \frac{1}{9}$ E $x \neq \frac{1}{7}$ → **A**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: A 1 B -1 C 0 D $+\infty$ E $-\infty$ → **D**

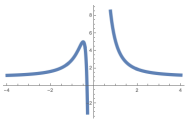
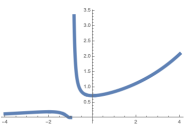
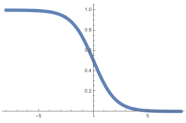
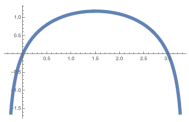
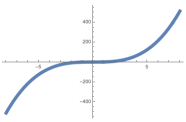
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $-2e^{3/2}$ B $\frac{5\sqrt{e}}{4}$ C 0 D $-\frac{3\sqrt{e}}{2}$ E $\frac{9}{4e^{3/2}}$ → **C**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = 0$ B $x = \frac{1}{2}\left(4 + \sqrt{2}\right)$ C $x = \frac{1}{2}\left(1 + \sqrt{2}\right)$ D $x = -1$ E $x = \frac{1}{2}\left(-1 - \sqrt{2}\right)$ → **A**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **B**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **9**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |1-x| - 2x \leq -2 \\ -x^2 + x + 1 > 1 - 3x. \end{cases}$$

Answer: [A] $x \geq 1$ [B] $1 \leq x < 4$ [C] $x \geq \frac{5}{3}$ [D] $\frac{2}{3} \leq x < 4$ [E] $-3 < x \leq -\frac{2}{3}$ → **B**

2) Compute all solutions of the inequality $-|x+1| - 3x - 1 > x^2$.

Answer: [A] $x < -\sqrt{2}$ or $x > 1 + \sqrt{5}$ [B] $-2 < x < \sqrt{2} - 2$ [C] $\frac{1}{2}\left(3 - \sqrt{21}\right) < x < \frac{1}{2}\left(3 + \sqrt{21}\right)$ → **B**
[D] $x < \frac{1}{3}\left(-1 - \sqrt{7}\right)$ or $x > \frac{2}{\sqrt{3}}$ [E] $x < \frac{1}{2}\left(-3 - \sqrt{5}\right)$ or $x > \frac{1}{2}\left(1 + \sqrt{13}\right)$

3) Compute the limit $\lim_{x \to 0} -\dfrac{e^{-x} - \cos(3x)}{9x}$.

Answer: [A] $-\frac{1}{3}$ [B] $\frac{1}{9}$ [C] $\frac{1}{3}$ [D] $\frac{5}{3}$ [E] $\frac{5}{9}$ [F] Does not exist → **B**

4) Compute the limit $\lim_{x \to 0} \dfrac{x^3 + 3x^2}{\sin(5x^2)}$.

Answer: [A] $\frac{1}{3}$ [B] $-\frac{1}{5}$ [C] $\frac{3}{5}$ [D] -3 [E] -1 [F] Does not exist → **C**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = x \log\left(\exp(-3x) + 4x^2 + 2\right).$$

Answer: [A] $\log(2)$ [B] $\log(3)$ [C] $\log(4)$ [D] $\log(5)$ [E] $\log(6)$ → **B**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{1-x^2}}{1-x}.$$

Answer: [A] $x \neq 0$ [B] $x \neq -1$ [C] All $\mathbb{R}$ [D] $x \leq 0$ [E] $x \neq 1$ → **E**

7) Compute the limit as $x \to 1-$ of $f(x)$.

Answer: [A] 0 [B] $-\infty$ [C] 1 [D] $+\infty$ [E] -1 → **D**

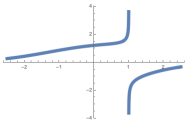
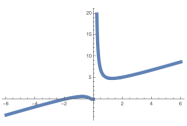
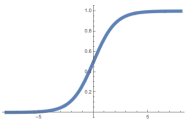
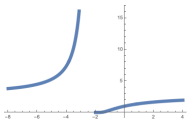
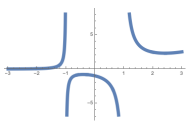
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] $2e$ [B] $-e$ [C] e [D] $4e$ [E] $-4e$ → **C**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = -\sqrt{\frac{3}{2}}$ [B] Noo [C] $x = \frac{1}{12}\left(\sqrt{73} - 5\right)$ [D] $x = \frac{1}{2}\left(\sqrt{3} - 1\right)$ [E] $x = \frac{1}{\sqrt{2}}$ → **B**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  → **A**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **10**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |-x-1| > -2x-2 \\ x > -3x^2+x-2. \end{cases}$$

Answer: [A] $x < -\sqrt{\frac{2}{3}}$ or $\sqrt{\frac{2}{3}} < x < 2$ [B] $2-\sqrt{2} < x < 3$ [C] $x < 0$ [D] $x < -1$ or $-\frac{1}{3} < x < \frac{2}{3}$ [E] $x > -1$ →**E**

2) Compute all solutions of the inequality $|x+1|+x-1 \le -x^2$.

Answer: [A] $x \le 0$ or $x \ge 1$ [B] $x \ge \frac{1}{3}$ [C] $-1-\sqrt{3} \le x \le 2$ [D] $x \le -2$ or $x \ge \frac{1}{2}(\sqrt{5}-1)$ [E] $-\sqrt{2} \le x \le 0$ →**E**

3) Compute the limit $\lim_{x\to 0-} \frac{\sin(5x)}{e^{-x}-1}$.

Answer: [A] -5 [B] $-\frac{5}{3}$ [C] Does not exist [D] -1 [E] $-\frac{1}{3}$ [F] 1 →**A**

4) Compute the limit $\lim_{x\to 0} \frac{2x^3+x^2}{1-\cos(x)}$.

Answer: [A] $\frac{2}{25}$ [B] $\frac{4}{25}$ [C] Does not exist [D] 4 [E] 2 [F] $\frac{2}{49}$ →**E**

5) Compute the value $f'(0)$ of the derivative in $x=0$ for the function

$$f(x) = (x^2+1)\cos\left(x-\frac{\pi}{2}\right).$$

Answer: [A] 1 [B] -3 [C] -2 [D] -1 [E] 2 →**A**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{-x^2-x+1}}{1-3x}.$$

Answer: [A] $x \le 0$ [B] $x \ne -1$ [C] $x \ne -\frac{1}{3}$ [D] All $\mathbb{R}$ [E] $x \ne \frac{1}{3}$ →**E**

7) Compute the limit as $x \to \frac{1}{3}-$ of $f(x)$.

Answer: [A] $+\infty$ [B] -1 [C] 0 [D] $-\infty$ [E] 1 →**A**

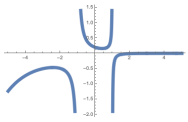
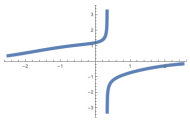
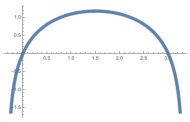
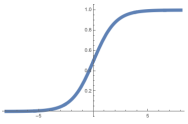
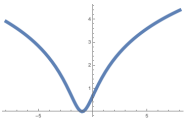
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x=0$.

Answer: [A] $4e$ [B] $2e$ [C] $3e$ [D] $-3e$ [E] Non definita →**B**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x=0$ [B] $x = \frac{1}{6}(2+\sqrt{34})$ [C] Noo [D] $x = \frac{1}{2}(2-\sqrt{2})$ [E] $x = \frac{1}{2}(\sqrt{3}-1)$ →**C**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  →**B**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **11**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x+3| - 2x \leq 1 \\ -x^2 + x + 1 > x + 1. \end{cases}$$

Answer: [A] $x > 2$ [B] $2 \leq x < 4$ [C] No x [D] $x > 1$ or $x \leq 0$ [E] $x \leq -3$ →**C**

2) Compute all solutions of the inequality $2\,|x-1| + x - 3 \leq -x^2$.

Answer: [A] $\frac{1}{2}\left(3 - \sqrt{13}\right) \leq x \leq \frac{1}{2}\left(3 + \sqrt{13}\right)$ [B] $x \leq -\frac{4}{3}$ or $x \geq 0$ [C] $\frac{1}{2}\left(1 - \sqrt{5}\right) \leq x \leq \frac{1}{2}\left(\sqrt{29} - 3\right)$ →**C**
[D] $1 - \sqrt{5} \leq x \leq 2 + \sqrt{6}$ [E] $-2 \leq x \leq 1 + \sqrt{3}$

3) Compute the limit $\lim_{x \to 0+} \dfrac{e^{x^2+3x} - 1}{3x}$.

Answer: [A] Does not exist [B] 1 [C] $-\frac{1}{9}$ [D] $\frac{1}{3}$ [E] $\frac{1}{9}$ [F] -1 →**B**

4) Compute the limit $\lim_{x \to 0-} \dfrac{\sin\left(x - x^2\right)}{x^3 + 3x}$.

Answer: [A] $\frac{1}{7}$ [B] $\frac{1}{5}$ [C] $\frac{2}{5}$ [D] $\frac{1}{3}$ [E] $\frac{2}{7}$ [F] Does not exist →**D**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \log\left(1 + \frac{x}{2x+1}\right).$$

Answer: [A] 7 [B] 3 [C] 4 [D] 1 [E] 6 →**D**

6) Find the domain of definition of the function

$$f(x) = e^{-x + \frac{1}{x-2} + 1}.$$

Answer: [A] $x \neq \frac{1}{3}$ [B] $x \neq \frac{7}{9}$ [C] $x \neq 2$ [D] $x \neq -\frac{3}{7}$ [E] $x \neq -\frac{3}{8}$ →**C**

7) Compute the limit as $x \to -\infty$ of $f(x)$.

Answer: [A] $+\infty$ [B] 1 [C] $-\infty$ [D] 0 [E] -1 →**A**

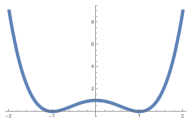
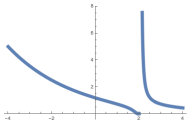
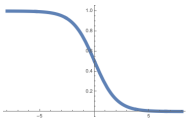
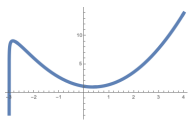
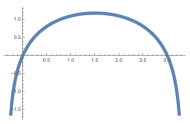
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] $\frac{3}{4e^{3/2}}$ [B] e [C] $-2e^{5/3}$ [D] $-\frac{5\sqrt{e}}{4}$ [E] $\frac{7}{4e^{3/2}}$ →**D**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = 2$ [B] Noo [C] $x = \frac{1}{2}\left(1 + \sqrt{2}\right)$ [D] $x = \frac{1}{2}\left(-1 - \sqrt{2}\right)$ [E] $x = \frac{1}{2}\left(-4 - \sqrt{2}\right)$ →**B**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  →**B**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **12**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} -x-2 \le x^2 - x \\ 2x - 3 > |-2x-1|. \end{cases}$$

Answer: [A] $\sqrt{6}-2 \le x < 2$ [B] No x [C] $x > 4$ [D] $x = 1$ [E] $-\frac{1}{3} < x \le \frac{1}{2}\left(1+\sqrt{5}\right)$ →**B**

2) Compute all solutions of the inequality $-2|x-3| - 3x + 1 > x^2$.

Answer: [A] $x < \frac{1}{3}\left(-2-\sqrt{34}\right)$ or $x > \frac{1}{3}\left(\sqrt{34}-2\right)$ [B] No x [C] -1 [D] $x < 1-\sqrt{7}$ or $x > 4$ [E] $x < -\sqrt{6}$ or $x > \sqrt{6}$ →**B**

3) Compute the limit $\lim_{x\to 0} \dfrac{e^{3x} - \cos(3x)}{9x}$.

Answer: [A] $-\frac{1}{3}$ [B] $\frac{1}{3}$ [C] $-\frac{5}{9}$ [D] Does not exist [E] $\frac{5}{3}$ [F] $\frac{1}{9}$ →**B**

4) Compute the limit $\lim_{x\to 0-} -\dfrac{\log(x+1)}{\sin(3x)}$.

Answer: [A] Does not exist [B] $\frac{1}{3}$ [C] -5 [D] -3 [E] 1 [F] $-\frac{1}{3}$ →**F**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \frac{\exp(x) + x^2}{4x+3}.$$

Answer: [A] $\frac{3}{4}$ [B] $-\frac{1}{9}$ [C] $\frac{7}{16}$ [D] $-\frac{4}{9}$ [E] $\frac{1}{4}$ →**B**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{x^2+x+1}}{3x+1}.$$

Answer: [A] $x \neq -\frac{1}{3}$ [B] $x \neq -1$ [C] $x \le 0$ [D] $x \neq 0$ [E] $x \neq 1$ →**A**

7) Compute the limit as $x \to -\frac{1}{3}-$ of $f(x)$.

Answer: [A] -1 [B] $-\infty$ [C] 0 [D] 1 [E] $+\infty$ →**B**

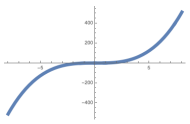
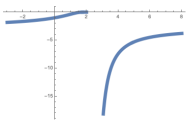
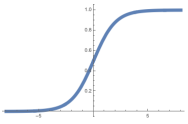
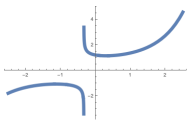
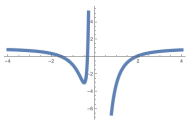
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] e [B] $-5e$ [C] $5e$ [D] $-2e$ [E] Non definita →**D**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = \frac{1}{2}\left(\sqrt{2}-2\right)$ [B] $x = \frac{1}{6}\left(2+\sqrt{34}\right)$ [C] $x = \frac{1}{6}\left(-2-\sqrt{34}\right)$ [D] $x = \frac{1}{12}\left(\sqrt{73}-5\right)$ [E] Noo →**D**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  →**D**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **13**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} x^2 + x - 2 < x^2 \\ -x \geq |2x - 1| + 1. \end{cases}$$

Answer: A $-1 < x \leq 0$ B $-\frac{2}{3} \leq x < -\frac{1}{3}$ C No x D $\frac{1}{3} \leq x \leq 1$ E $0 \leq x \leq \frac{2}{3}$ → **C**

2) Compute all solutions of the inequality $2\,|x - 3| + x + 1 > -3x^2$.

Answer: A $x < 3$ or $x > 3$ B $x < \frac{1}{6}\left(-1 - \sqrt{109}\right)$ or $x > \frac{1}{6}\left(\sqrt{109} - 1\right)$ C $x < -6$ or $x > 2$ D All $\mathbf{R}$ → **D**
E $x < -\sqrt{10}$ or $x > 4$

3) Compute the limit $\lim_{x \to 0+} \dfrac{x - x^2}{-x + e^x - 1}$.

Answer: A 1 B -1 C $\frac{1}{2}$ D ∞ E $-\frac{1}{2}$ F Does not exist → **D**

4) Compute the limit $\lim_{x \to 0-} \dfrac{\log(5x + 1)}{\sin(x)}$.

Answer: A -3 B 1 C Does not exist D -5 E 5 F $\frac{5}{3}$ → **E**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \frac{\exp(-2x) + x^2}{2x + 4}.$$

Answer: A $\frac{2}{9}$ B $-\frac{5}{8}$ C $-\frac{3}{8}$ D $\frac{1}{3}$ E -2 → **B**

6) Find the domain of definition of the function

$$f(x) = e^{-2x + \frac{1}{-2x-2} - 2}.$$

Answer: A $x \neq -1$ B $x \neq -\frac{2}{7}$ C $x \neq -\frac{1}{10}$ D $x \neq \frac{9}{10}$ E $x \neq \frac{1}{8}$ → **A**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: A 0 B $+\infty$ C $-\infty$ D -1 E 1 → **A**

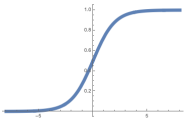
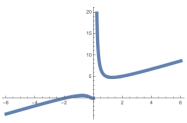
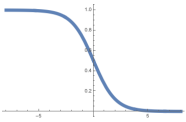
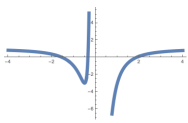
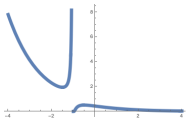
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $-\frac{5}{2e^{5/2}}$ B $\frac{3e^{3/2}}{4}$ C $\frac{4}{e}$ D $-\frac{3}{2e^{5/2}}$ E $-\frac{7}{4e^{5/2}}$ → **D**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = -\frac{3}{2}$ B $x = \frac{1}{2}\left(1 - \sqrt{2}\right)$ C $x = \frac{1}{2}\left(\sqrt{2} - 2\right)$ D $x = 2$ E $x = \frac{3}{2}$ → **A**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **E**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **14**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |3-x| > 2x+1 \\ x > x^2 - 2x - 2. \end{cases}$$

Answer: [A] $x < \frac{1}{3}\left(-2-\sqrt{7}\right)$ or $\frac{1}{3}\left(\sqrt{7}-2\right) < x < 5$ [B] $\frac{1}{2}\left(3-\sqrt{17}\right) < x < \frac{2}{3}$ [C] $2-\sqrt{3} < x < 1$ [D] $\frac{1}{2}\left(3-\sqrt{13}\right) < x < \frac{1}{2}\left(3+\sqrt{13}\right)$ [E] $-5 < x < -\frac{4}{3}$ or $x > 0$ → **B**

2) Compute all solutions of the inequality $x^2 < 2 - x + |-2x+2|$.

Answer: [A] $-\sqrt{3}$ [B] $\frac{1}{2}\left(-3-\sqrt{17}\right) < x < 1$ [C] $-\frac{5}{4} < x < 1$ [D] $-4 < x < 1$ [E] $0 < x < \frac{1}{4}$ → **D**

3) Compute the limit $\lim_{x\to 0+} \dfrac{e^{-3x^2-3x}-1}{3x}$.

Answer: [A] -1 [B] Does not exist [C] $\frac{1}{3}$ [D] $-\frac{1}{9}$ [E] 1 [F] $-\frac{1}{3}$ → **A**

4) Compute the limit $\lim_{x\to 0+} -\dfrac{\log(x+1)}{\sin(x)}$.

Answer: [A] 3 [B] 5 [C] -3 [D] -5 [E] -1 [F] Does not exist → **E**

5) Compute the value $f'(0)$ of the derivative in $x=0$ for the function

$$f(x) = x\cos\left(x^2+x-\frac{\pi}{2}\right).$$

Answer: [A] 1 [B] 0 [C] 2 [D] -2 [E] -1 → **B**

6) Find the domain of definition of the function

$$f(x) = 2x + \log\left(\frac{-x-4}{2x-1}\right).$$

Answer: [A] $-4 < x < -1$ [B] $-3 < x < -1$ [C] $-4 < x < \frac{1}{2}$ [D] $1 < x < 2$ [E] $x < 1$ or $x > 2$ → **C**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: [A] -1 [B] $\frac{2}{3}$ [C] $-\frac{1}{2}$ [D] $-\frac{1}{8}$ [E] Does not exist → **E**

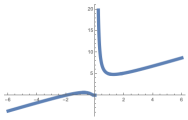
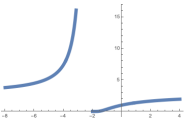
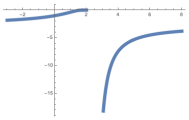
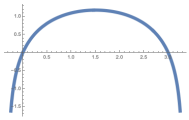
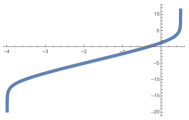
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x=0$.

Answer: [A] $\frac{1}{3}$ [B] $\frac{17}{4}$ [C] $-\frac{15}{8}$ [D] 5 [E] $\frac{7}{3}$ → **B**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = \frac{1}{2}\left(1+\sqrt{35}\right)$ [B] $x = -1-\sqrt{2}$ [C] $x = \frac{1}{2}\left(\sqrt{3}-7\right)$ [D] Noo [E] $x = \frac{1}{4}\left(1-\sqrt{21}\right)$ → **D**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  → **E**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **15**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x+1| + 2x \leq -2 \\ x^2 + x + 1 > 1 - 3x. \end{cases}$$

Answer: [A] $x > 1$ or $x \leq 0$ [B] $-3 < x \leq -1$ [C] $x \leq -5$ [D] $0 < x < 1$ [E] $x < -4$ →**E**

2) Compute all solutions of the inequality $3x^2 < -2 - x + |-2x + 2|$.

Answer: [A] $\frac{1}{4}\left(-1 - \sqrt{41}\right) < x < \frac{1}{4}\left(\sqrt{41} - 1\right)$ [B] $\frac{1}{4}\left(3 - \sqrt{33}\right) < x < \frac{1}{4}\left(3 + \sqrt{33}\right)$ →**E**
[C] $\frac{1}{2}\left(-3 - \sqrt{13}\right) < x < \frac{1}{2}\left(1 + \sqrt{13}\right)$ [D] $\frac{1}{4}\left(1 - \sqrt{33}\right) < x < \frac{1}{4}\left(1 + \sqrt{33}\right)$ [E] $-1 < x < 0$

3) Compute the limit $\lim_{x \to 0-} \dfrac{x - x^2}{x + e^x - 1}$.

Answer: [A] 1 [B] $\frac{1}{2}$ [C] Does not exist [D] $-\infty$ [E] -1 [F] $-\frac{1}{2}$ →**B**

4) Compute the limit $\lim_{x \to 0} \dfrac{x^3 + x^2}{1 - \cos(x)}$.

Answer: [A] $\frac{4}{49}$ [B] $\frac{4}{9}$ [C] 4 [D] $\frac{2}{25}$ [E] 2 [F] Does not exist →**E**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \cos(-x \exp(x) + \pi).$$

Answer: [A] -2 [B] -1 [C] 0 [D] 2 [E] 1 →**C**

6) Find the domain of definition of the function

$$f(x) = 2 \log\left(-x^2 - x + 3\right).$$

Answer: [A] $-2 < x < 1$ [B] $x < 1$ or $x > 2$ [C] $x \neq 0$ [D] $\frac{1}{2}\left(-1 - \sqrt{13}\right) < x < \frac{1}{2}\left(\sqrt{13} - 1\right)$ →**D**
[E] $\frac{1}{2}\left(1 - \sqrt{13}\right) < x < \frac{1}{2}\left(1 + \sqrt{13}\right)$

7) Compute the limit as $x \to -\infty$ of $f(x)$.

Answer: [A] $+\infty$ [B] Does not exist [C] 1 [D] $-\infty$ [E] 0 →**B**

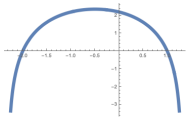
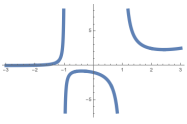
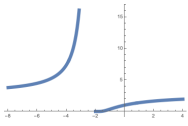
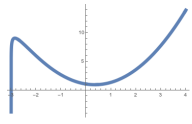
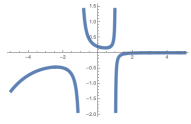
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] 1 [B] -3 [C] -1 [D] $-\frac{2}{3}$ [E] -2 →**D**

9) Which are the points of minimum of $f(x)$?

Answer: [A] Noo [B] $x = \frac{3}{2}$ [C] $x = \frac{1}{2}$ [D] $x = -\frac{3}{2}$ [E] $x = -\frac{1}{6}$ →**A**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  →**A**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **16**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x+1| + 2x \leq 1 \\ x^2 + x + 2 > 2 - 3x. \end{cases}$$

Answer: [A] $x < -4$ [B] $x > 3$ [C] $x > 0$ [D] $x \leq -5$ [E] $0 < x < 1$ →**A**

2) Compute all solutions of the inequality $-|x-1| - x - 3 \leq 3x^2$.

Answer: [A] All $\mathbf{R}$ [B] $x \leq -1 - \sqrt{2}$ or $x \geq \sqrt{2} - 1$ [C] $\frac{1}{2}\left(1 - \sqrt{13}\right) \leq x \leq \frac{1}{2}\left(5 + \sqrt{21}\right)$ [D] $x \leq \frac{1}{3}\left(-2 - \sqrt{10}\right)$ or $x \geq \frac{1}{3}\left(\sqrt{10} - 2\right)$ [E] $-1 - \sqrt{7} \leq x \leq 4$ →**A**

3) Compute the limit $\lim_{x \to 0+} \dfrac{e^{-x} - \cos(x)}{9x}$.

Answer: [A] $\frac{5}{9}$ [B] $-\frac{5}{3}$ [C] $-\frac{1}{3}$ [D] 1 [E] Does not exist [F] $-\frac{1}{9}$ →**F**

4) Compute the limit $\lim_{x \to 0} \dfrac{\log(5x+1)}{x - x^2}$.

Answer: [A] 5 [B] $-\frac{1}{3}$ [C] -3 [D] 1 [E] Does not exist [F] $\frac{5}{3}$ →**A**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = x \cos\left(4x^2 + 2x\right).$$

Answer: [A] 1 [B] 2 [C] 0 [D] -2 [E] -1 →**A**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{x^2 - 2x + 1}}{1 - 3x}.$$

Answer: [A] $x \neq \frac{1}{3}$ [B] $x \neq 1$ [C] $x > 0$ [D] All $\mathbb{R}$ [E] $x \neq -\frac{1}{3}$ →**A**

7) Compute the limit as $x \to \frac{1}{3}-$ of $f(x)$.

Answer: [A] 1 [B] $-\infty$ [C] -1 [D] $+\infty$ [E] 0 →**D**

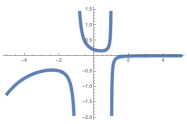
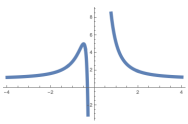
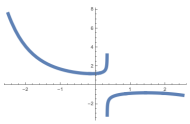
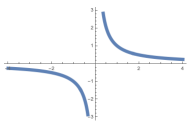
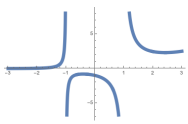
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] $-4e$ [B] e [C] $-3e$ [D] $3e$ [E] Non definita →**B**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = \frac{1}{6}\left(2 + \sqrt{34}\right)$ [B] $x = \frac{1}{6}\left(4 - \sqrt{22}\right)$ [C] $x = \frac{1}{6}\left(\sqrt{19} - 1\right)$ [D] $x = \frac{1}{2}\left(\sqrt{3} - 1\right)$ [E] $x = \frac{1}{12}\left(-1 - \sqrt{97}\right)$ →**B**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  →**C**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **17**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} 2x^2 - x - 2 < -2x^2 \\ -x \geq |-2x - 1| + 1. \end{cases}$$

Answer: A $\frac{1}{6}\left(-3-\sqrt{33}\right) < x \leq 0$ B $-1 \leq x < -\frac{1}{3}$ C No x D $\frac{1}{8}\left(1-\sqrt{33}\right) < x \leq 0$ E $\frac{1}{3} \leq x < \frac{1}{8}\left(\sqrt{33}-1\right)$ →**C**

2) Compute all solutions of the inequality $-2|x-1| - x - 1 > -3x^2$.

Answer: A $x < \frac{1}{2}\left(3-\sqrt{13}\right)$ or $x > \frac{1}{2}\left(\sqrt{21}-1\right)$ B $x < -\sqrt{2}$ or $x > 3+\sqrt{5}$ C $x < 0$ or $x > 1$ D $x < \frac{1}{6}\left(-1-\sqrt{37}\right)$ or $x > \frac{1}{6}\left(\sqrt{37}-1\right)$ E $-4 < x < 0$ →**D**

3) Compute the limit $\lim_{x\to 0+} \frac{\sin(3x)}{e^{-3x}-1}$.

Answer: A -3 B Does not exist C -5 D $-\frac{5}{3}$ E $\frac{5}{3}$ F -1 →**F**

4) Compute the limit $\lim_{x\to 0+} \frac{x^3+x^2}{\sin(x^2)}$.

Answer: A $-\frac{3}{5}$ B 1 C Does not exist D $\frac{1}{3}$ E $\frac{1}{5}$ F $-\frac{1}{5}$ →**B**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \log\left(1 + \frac{x}{2x+1}\right).$$

Answer: A 6 B 3 C 7 D 4 E 1 →**E**

6) Find the domain of definition of the function

$$f(x) = -\frac{e^{-x^2-2x+1}}{x}.$$

Answer: A $x \neq 1$ B All $\mathbb{R}$ C $x \neq 0$ D $x \neq -\frac{1}{3}$ E $x \neq -1$ →**C**

7) Compute the limit as $x \to 0-$ of $f(x)$.

Answer: A 1 B $-\infty$ C -1 D 0 E $+\infty$ →**E**

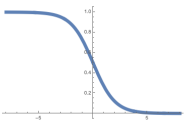
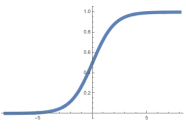
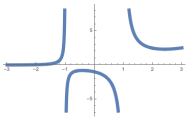
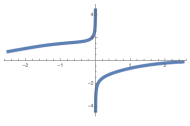
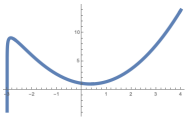
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $-e$ B Non definita C $5e$ D $-2e$ E $-3e$ →**B**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = 2$ B $x = 0$ C $x = -1$ D Noo E $x = \frac{1}{2}\left(1+\sqrt{3}\right)$ →**D**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  →**D**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **18**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |-x-1| > 2x+1 \\ 2x > x^2+x-2. \end{cases}$$

Answer: [A] $-2 < x < -1$ or $x > 0$ [B] $-1 < x < 0$ [C] $1 < x < 2$ [D] $-1 < x < -\frac{1}{\sqrt{3}}$ or $x > \frac{1}{\sqrt{3}}$ [E] $x < \frac{1}{3}\left(-2-\sqrt{7}\right)$ or $\frac{1}{3}\left(\sqrt{7}-2\right) < x < 2$ → **B**

2) Compute all solutions of the inequality $-2x^2 + |-x-2| \geq x-4$.

Answer: [A] $x \leq \frac{1}{4}\left(-3-\sqrt{41}\right)$ or $x \geq \frac{1}{4}\left(\sqrt{41}-3\right)$ [B] $\frac{1}{4}\left(1-\sqrt{17}\right) \leq x \leq \frac{1}{4}\left(5+\sqrt{41}\right)$ [C] $x \leq -2$ or $x \geq \frac{1}{4}\left(\sqrt{41}-5\right)$ [D] $x \leq -6$ or $x \geq \frac{2}{3}$ [E] $-\sqrt{3} \leq x \leq \sqrt{3}$ → **E**

3) Compute the limit $\lim_{x\to 0+} \dfrac{e^x - \cos(x)}{3x}$.

Answer: [A] -1 [B] $-\frac{5}{9}$ [C] $-\frac{5}{3}$ [D] $\frac{1}{3}$ [E] 1 [F] Does not exist → **D**

4) Compute the limit $\lim_{x\to 0-} \dfrac{\sin\left(x^2+x\right)}{5x-x^3}$.

Answer: [A] $\frac{2}{5}$ [B] $\frac{2}{3}$ [C] $\frac{2}{7}$ [D] $\frac{1}{3}$ [E] Does not exist [F] $\frac{1}{5}$ → **F**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \left(x^2+2\right)\log(x+2).$$

Answer: [A] 2 [B] $\frac{4}{3}$ [C] 1 [D] $\frac{1}{3}$ [E] 6 → **C**

6) Find the domain of definition of the function

$$f(x) = \log(2x+2) - \frac{1}{3x-1}.$$

Answer: [A] $-1 < x < \frac{1}{3}$ or $x > \frac{1}{3}$ [B] $x < \frac{1}{3}$ or $\frac{1}{3} < x < 2$ [C] $-2 < x < \frac{1}{3}$ or $x > \frac{1}{3}$ [D] $-\frac{3}{2} < x < \frac{1}{3}$ or $x > \frac{1}{3}$ [E] $x \neq 0$ → **A**

7) Compute the limit as $x \to -\infty$ of $f(x)$.

Answer: [A] $+\infty$ [B] $-\infty$ [C] 1 [D] Does not exist [E] -1 → **D**

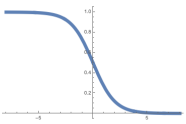
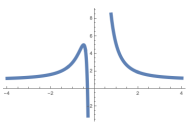
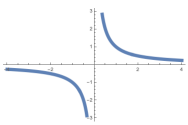
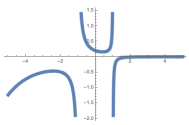
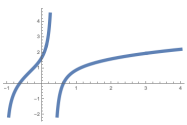
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] 4 [B] $-\frac{12}{11}$ [C] $-\frac{14}{9}$ [D] $\frac{14}{11}$ [E] $\frac{2}{9}$ → **A**

9) Which are the points of minimum of $f(x)$?

Answer: [A] Noo [B] $x = \frac{1}{3}\left(2+2\sqrt{3}\right)$ [C] $x = 2+\sqrt{5}$ [D] $x = \frac{1}{2}\left(3+\sqrt{17}\right)$ [E] $x = \frac{1}{3}\left(2+\sqrt{21}\right)$ → **A**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  → **E**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **19**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} 2x^2 + x - 2 < -2x^2 \\ x \geq |2x+1| - 1. \end{cases}$$

Answer: A $-\frac{2}{3} \leq x \leq 0$ B $0 \leq x < \frac{1}{2}\left(\sqrt{17} - 3\right)$ C $-1 < x \leq -\frac{1}{3}$ D $\frac{1}{6}\left(-3 - \sqrt{33}\right) < x \leq 0$ E $x > 2$ → **A**

2) Compute all solutions of the inequality $2|x-3| - x + 1 \leq 3x^2$.

Answer: A -1 B $x \leq \frac{1}{2}\left(-5 - \sqrt{53}\right)$ or $x \geq \frac{1}{2}\left(\sqrt{53} - 5\right)$ C $x \leq -2$ or $x \geq 1$ D $x \leq \frac{1}{6}\left(-3 - \sqrt{93}\right)$ or $x \geq \frac{1}{6}\left(\sqrt{93} - 3\right)$ E $x \leq -1$ or $x \geq 1$ → **D**

3) Compute the limit $\lim_{x \to 0-} \dfrac{e^{-x} - \cos(x)}{3x}$.

Answer: A $-\frac{5}{9}$ B $-\frac{1}{9}$ C $-\frac{1}{3}$ D -1 E Does not exist F 1 → **C**

4) Compute the limit $\lim_{x \to 0-} \dfrac{\log(3x+1)}{-x^2 - 3x}$.

Answer: A -3 B -1 C $-\frac{1}{3}$ D 3 E $-\frac{5}{3}$ F Does not exist → **B**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \frac{\sin(-2x)}{3x^2 + 1}.$$

Answer: A $\frac{1}{2}$ B $-\frac{1}{2}$ C -2 D $-\frac{1}{3}$ E 1 → **C**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{1-x^2}}{1-x}.$$

Answer: A $x \neq -1$ B $x \leq 0$ C All $\mathbb{R}$ D $x \neq 1$ E $x \neq 0$ → **D**

7) Compute the limit as $x \to 1-$ of $f(x)$.

Answer: A $-\infty$ B 0 C -1 D 1 E $+\infty$ → **E**

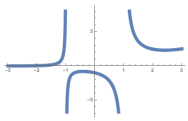
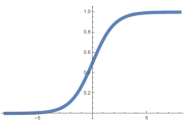
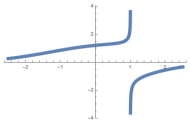
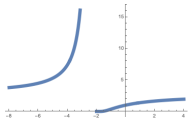
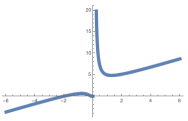
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $2e$ B e C $-e$ D $-4e$ E $4e$ → **B**

9) Which are the points of minimum of $f(x)$?

Answer: A Noo B $x = \frac{1}{\sqrt{2}}$ C $x = -\sqrt{\frac{3}{2}}$ D $x = \frac{1}{2}\left(\sqrt{3} - 1\right)$ E $x = \frac{1}{12}\left(\sqrt{73} - 5\right)$ → **A**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **C**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **20**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x-1| - 2x \leq -2 \\ -x^2 - 2x + 2 > x + 2. \end{cases}$$

Answer: [A] $x \geq 3$ [B] $x \leq -2$ [C] $x > 2$ [D] $x \leq -\frac{5}{3}$ [E] No x → **E**

2) Compute all solutions of the inequality $|x-3| - x - 3 \leq 2x^2$.

Answer: [A] $x \leq \frac{1}{6}\left(-3 - \sqrt{93}\right)$ or $x \geq \frac{1}{6}\left(\sqrt{93} - 3\right)$ [B] 2 [C] $\frac{1}{2}\left(1 - \sqrt{29}\right) \leq x \leq \frac{1}{2}\left(5 + \sqrt{5}\right)$ [D] $x \leq -1$ or $x \geq 0$ [E] $x \leq -1$ or $x \geq 1$ → **D**

3) Compute the limit $\lim_{x \to 0} \dfrac{e^{3x^2+x} - 1}{3x}$.

Answer: [A] $\frac{1}{9}$ [B] $-\frac{1}{9}$ [C] $\frac{1}{3}$ [D] Does not exist [E] $-\frac{1}{3}$ [F] -1 → **C**

4) Compute the limit $\lim_{x \to 0+} -\dfrac{\log(1-3x)}{\sin(3x)}$.

Answer: [A] $-\frac{5}{3}$ [B] $\frac{1}{3}$ [C] Does not exist [D] $\frac{5}{3}$ [E] -5 [F] 1 → **F**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \frac{\sin(-2x)}{x^2 + 2}.$$

Answer: [A] $-\frac{2}{3}$ [B] 2 [C] $\frac{1}{2}$ [D] 0 [E] -1 → **E**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{x^2-x+1}}{1-x}.$$

Answer: [A] $x \neq -1$ [B] $x \neq 0$ [C] $x \leq 0$ [D] $x \neq 1$ [E] $x > 0$ → **D**

7) Compute the limit as $x \to 1-$ of $f(x)$.

Answer: [A] $+\infty$ [B] -1 [C] $-\infty$ [D] 1 [E] 0 → **A**

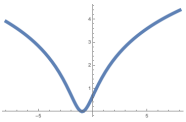
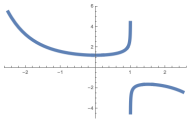
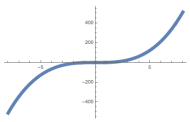
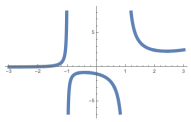
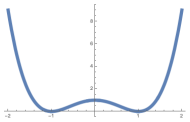
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] $3e$ [B] 0 [C] $-e$ [D] $4e$ [E] $2e$ → **B**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = 0$ [B] $x = -\sqrt{\frac{3}{2}}$ [C] $x = \frac{1}{12}\left(\sqrt{73} - 5\right)$ [D] $x = \frac{1}{\sqrt{2}}$ [E] $x = \frac{1}{4}\left(1 - \sqrt{17}\right)$ → **A**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  → **B**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **21**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} -x-2 \le x^2+x \\ x-3 > |x+1|\,. \end{cases}$$

Answer: A $-\frac{1}{3} < x < 1$ B $x > -\frac{1}{3}$ C $-\frac{1}{4} < x \le \frac{1}{2}\left(\sqrt{5}-1\right)$ D No x E $-\frac{1}{2} < x \le \frac{1}{2}\left(\sqrt{5}-1\right)$ →**D**

2) Compute all solutions of the inequality $-3\,|x+1| - 3x + 1 \le x^2$.

Answer: A $x \le -2$ or $x \ge \sqrt{7}-3$ B $\frac{1}{2}\left(3-\sqrt{13}\right) \le x \le \frac{1}{2}\left(3+\sqrt{13}\right)$ C $x \ge -2$ D $-\sqrt{2} \le x \le 1+\sqrt{5}$ →**A**
E $x \le -1$

3) Compute the limit $\lim_{x\to 0-} -\dfrac{e^{x^2+3x}-1}{3x}$.

Answer: A 1 B -1 C $-\frac{1}{3}$ D Does not exist E $-\frac{1}{9}$ F $\frac{1}{3}$ →**B**

4) Compute the limit $\lim_{x\to 0} \dfrac{\log(x+1)}{\sin(x)}$.

Answer: A $-\frac{5}{3}$ B -3 C $-\frac{1}{3}$ D 1 E -5 F Does not exist →**D**

5) Compute the value $f'(0)$ of the derivative in $x=0$ for the function

$$f(x) = (-2x+2)\log\left(\frac{1}{2x+1}\right).$$

Answer: A -8 B -4 C -1 D 6 E 8 →**B**

6) Find the domain of definition of the function

$$f(x) = e^{-2x+\frac{1}{-x-1}+2}.$$

Answer: A $x \ne \frac{7}{9}$ B $x \ne -1$ C $x \ne \frac{4}{9}$ D $x \ne -\frac{1}{2}$ E $x \ne \frac{4}{5}$ →**B**

7) Compute the limit as $x \to -\infty$ of $f(x)$.

Answer: A 0 B $+\infty$ C -1 D $-\infty$ E 1 →**B**

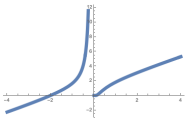
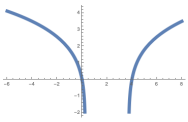
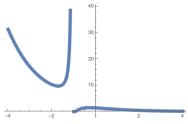
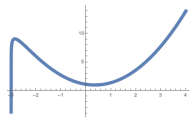
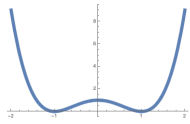
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x=0$.

Answer: A $\frac{7e^{3/2}}{4}$ B e^3 C $-e$ D $\frac{7\sqrt{e}}{4}$ E $2e^{4/3}$ →**C**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = \frac{1}{2}\left(4+\sqrt{2}\right)$ B $x = \frac{3}{2}$ C $x = -3$ D $x = \frac{1}{2}\left(-1-\sqrt{2}\right)$ E $x = \frac{1}{2}\left(-2-\sqrt{2}\right)$ →**E**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  →**C**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **22**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} x^2 - x - 2 < x^2 \\ x \geq |1 - 2x| + 1. \end{cases}$$

Answer: A $\frac{1}{3} \leq x < \frac{1}{8}\left(\sqrt{33} - 1\right)$ B $\frac{1}{8}\left(-1 - \sqrt{33}\right) < x \leq 0$ C $-2 \leq x < -\frac{1}{3}$ D $0 \leq x < \frac{1}{8}\left(\sqrt{33} - 1\right)$ E No x → **E**

2) Compute all solutions of the inequality $-2|x - 1| - x + 1 \leq -x^2$.

Answer: A $-1 - \sqrt{7} \leq x \leq 4$ B $\frac{1}{2}\left(5 - \sqrt{13}\right) \leq x \leq \frac{1}{2}\left(1 + \sqrt{5}\right)$ C $x \leq \frac{1}{2}\left(3 - \sqrt{5}\right)$ or $x \geq \frac{1}{2}\left(\sqrt{13} - 1\right)$ → **D**
D $\frac{1}{2}\left(-1 - \sqrt{5}\right) \leq x \leq \frac{1}{2}\left(\sqrt{5} - 1\right)$ E $x \leq 0$ or $x \geq 1$

3) Compute the limit $\lim_{x \to 0+} \dfrac{e^{5x} - \cos(x)}{3x}$.

Answer: A $-\frac{1}{3}$ B 1 C $-\frac{5}{3}$ D $\frac{5}{3}$ E $-\frac{1}{9}$ F Does not exist → **D**

4) Compute the limit $\lim_{x \to 0+} \dfrac{\sin\left(x^2 + x\right)}{x^3 + 3x}$.

Answer: A $\frac{1}{5}$ B $\frac{1}{7}$ C $\frac{2}{3}$ D Does not exist E $\frac{1}{3}$ F $\frac{2}{7}$ → **E**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = 2x \log\left(3x^2 + x + 1\right).$$

Answer: A 0 B $\log(3)$ C $2\log(2)$ D $\log(2)$ E $2\log(3)$ → **A**

6) Find the domain of definition of the function

$$f(x) = -2 \log\left(3x^2 - x + 1\right).$$

Answer: A $\frac{1}{2}\left(-3 - \sqrt{13}\right) < x < \frac{1}{2}\left(\sqrt{13} - 3\right)$ B $x \neq 0$ C $-1 < x < 2$ D All $\mathbb{R}$ E $x \neq 1$ → **D**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: A 0 B $+\infty$ C $-\infty$ D -1 E Does not exist → **C**

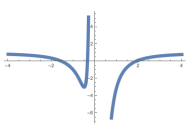
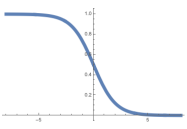
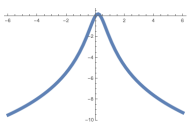
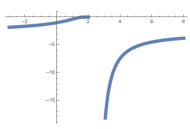
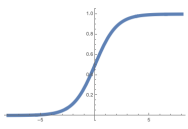
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A 6 B $-\frac{2}{3}$ C 2 D -1 E $\frac{2}{3}$ → **C**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = 2$ B Noo C $x = 1$ D $x = -\frac{1}{2}$ E $x = 0$ → **B**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **C**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **23**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} 2 - x \leq x^2 + x \\ x - 3 > |-2x - 1| \, . \end{cases}$$

Answer: A No x B $1 - \sqrt{2} \leq x \leq 1 + \sqrt{2}$ C $\sqrt{3} - 1 \leq x < 2$ D $x > -\frac{1}{3}$ E $x > 2$ → **A**

2) Compute all solutions of the inequality $-3\,|x - 1| - 3x - 1 \leq 2x^2$.

Answer: A $\frac{1}{2}\left(-1 - \sqrt{5}\right) \leq x \leq \frac{1}{2}\left(\sqrt{5} - 1\right)$ B $\frac{1}{2}\left(3 - \sqrt{5}\right) \leq x \leq \frac{1}{2}\left(3 + \sqrt{5}\right)$ C All $\mathbf{R}$ D $x \leq \frac{1}{2}\left(-1 - \sqrt{5}\right)$ or $x \geq \frac{1}{2}\left(\sqrt{5} - 1\right)$ E $x \leq -\frac{1}{2}$ or $x \geq 1$ → **C**

3) Compute the limit $\lim_{x \to 0-} \dfrac{\sin(5x)}{e^{3x} - 1}$.

Answer: A Does not exist B 1 C $-\frac{5}{3}$ D $\frac{1}{3}$ E $\frac{5}{3}$ F 5 → **E**

4) Compute the limit $\lim_{x \to 0-} \dfrac{\log(5x + 1)}{3x - x^2}$.

Answer: A -3 B $\frac{1}{3}$ C 1 D -1 E $\frac{5}{3}$ F Does not exist → **E**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \left(-x^2 - 1\right)\cos(2x - \pi).$$

Answer: A 3 B 1 C 2 D 0 E -2 → **D**

6) Find the domain of definition of the function

$$f(x) = \frac{1}{-e^{-x} - 2}.$$

Answer: A $x \neq \log(2)$ B $x \neq -\log\left(\frac{4}{3}\right)$ C $x \neq \frac{\log(2)}{2}$ D $x \neq \log(5)$ E All $\mathbb{R}$ → **E**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: A $-\frac{1}{2}$ B 3 C 2 D -2 E $+\infty$ → **A**

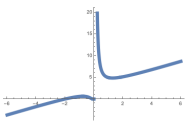
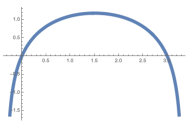
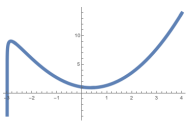
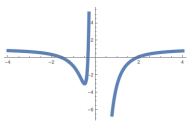
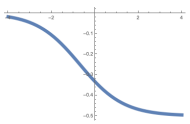
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $-\frac{1}{2}$ B -2 C $-\frac{3}{4}$ D $-\frac{1}{9}$ E $-\frac{4}{3}$ → **D**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = 1$ B Noo C $x = 0$ D $x = -1$ E $x = 2$ → **B**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **E**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **24**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} x+2 \le x^2 - x \\ x - 3 > |1-2x| \, . \end{cases}$$

Answer: [A] $x > -\frac{1}{3}$ [B] $\sqrt{6} - 2 \le x < 2$ [C] $x = 1$ [D] $0 < x \le 1$ [E] No x →**E**

2) Compute all solutions of the inequality $-2\,|x-3| - 3x - 1 > -2x^2$.

Answer: [A] $x < \frac{1}{4}\left(1 - \sqrt{57}\right)$ or $x > \frac{1}{4}\left(1 + \sqrt{57}\right)$ [B] $x > 1$ [C] $x < -\sqrt{6}$ or $x > \sqrt{6}$ [D] $x < -\frac{2}{\sqrt{3}}$ or $x > \frac{2}{\sqrt{3}}$ [E] $x < -\sqrt{\frac{10}{3}}$ or $x > \sqrt{\frac{10}{3}}$ →**A**

3) Compute the limit $\lim_{x \to 0} \dfrac{e^{3x^2 - 3x} - 1}{3x}$.

Answer: [A] $-\frac{1}{3}$ [B] -1 [C] $\frac{1}{9}$ [D] Does not exist [E] 1 [F] $\frac{1}{3}$ →**B**

4) Compute the limit $\lim_{x \to 0+} \dfrac{\sin\left(x - x^2\right)}{3x - 2x^3}$.

Answer: [A] $\frac{1}{7}$ [B] $\frac{1}{5}$ [C] $\frac{2}{5}$ [D] $\frac{2}{7}$ [E] $\frac{1}{3}$ [F] Does not exist →**E**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = x \log\left(\exp(-3x) + 3x^2 + 4\right).$$

Answer: [A] $\log(2)$ [B] $\log(5)$ [C] $\log(4)$ [D] $\log(3)$ [E] $\log(6)$ →**B**

6) Find the domain of definition of the function

$$f(x) = e^{-x + \frac{1}{2x-1} + 2}.$$

Answer: [A] $x \neq \frac{2}{3}$ [B] $x \neq \frac{1}{2}$ [C] $x \neq -\frac{2}{9}$ [D] $x \neq 0$ [E] $x \neq -\frac{3}{7}$ →**B**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: [A] $-\infty$ [B] 0 [C] -1 [D] 1 [E] $+\infty$ →**B**

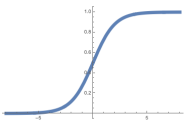
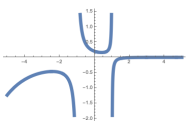
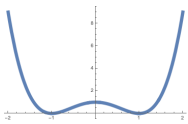
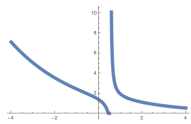
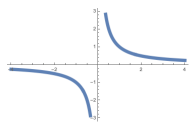
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] $-\frac{5\sqrt{e}}{2}$ [B] $-3e^{9/4}$ [C] $-3e$ [D] $\frac{1}{e}$ [E] $4e^{4/3}$ →**C**

9) Which are the points of minimum of $f(x)$?

Answer: [A] Noo [B] $x = 3$ [C] $x = \frac{1}{2}\left(1 + \sqrt{2}\right)$ [D] $x = \frac{1}{2}\left(1 - \sqrt{2}\right)$ [E] $x = 1$ →**A**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  →**D**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **25**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x+3| > -2x-2 \\ x > x^2 - 2x + 2. \end{cases}$$

Answer: A $\frac{1}{2}\left(3-\sqrt{17}\right) < x < 3$ B $x < -\frac{1}{\sqrt{3}}$ or $\frac{1}{\sqrt{3}} < x < 1$ C $1 < x < 2$ D $x < \frac{1}{6}\left(-1-\sqrt{13}\right)$ E $-\frac{5}{3} < x < 0$ or $x > 0$ → **C**

2) Compute all solutions of the inequality $-3\,|x-1| - 3x - 3 \le 3x^2$.

Answer: A $x \le \frac{1}{6}\left(-5-\sqrt{37}\right)$ or $x \ge \frac{1}{6}\left(\sqrt{37}-5\right)$ B $x \le -\frac{1}{2}$ or $x \ge 1$ C All $\mathbf{R}$ D $x \le \frac{1}{2}\left(-5-\sqrt{37}\right)$ or $x \ge \frac{1}{2}\left(\sqrt{37}-5\right)$ E $\frac{1}{2}\left(-3-\sqrt{21}\right) \le x \le \frac{1}{2}\left(\sqrt{21}-3\right)$ → **C**

3) Compute the limit $\lim_{x\to 0} -\dfrac{e^{-3x}-\cos(3x)}{9x}$.

Answer: A $-\frac{1}{9}$ B Does not exist C $-\frac{5}{9}$ D $\frac{1}{9}$ E $\frac{1}{3}$ F $-\frac{5}{3}$ → **E**

4) Compute the limit $\lim_{x\to 0-} \dfrac{\log(3x+1)}{\sin(x)}$.

Answer: A -1 B -5 C Does not exist D $\frac{5}{3}$ E 3 F $\frac{1}{3}$ → **E**

5) Compute the value $f'(0)$ of the derivative in $x=0$ for the function

$$f(x) = -\frac{x\exp(2x)}{2x+1}.$$

Answer: A -1 B -2 C 0 D 1 E $-\frac{1}{2}$ → **A**

6) Find the domain of definition of the function

$$f(x) = e^{x+\frac{1}{x+1}-1}.$$

Answer: A $x \ne \frac{2}{9}$ B $x \ne -1$ C $x \ne -\frac{8}{9}$ D $x \ne -\frac{3}{5}$ E $x \ne -\frac{1}{6}$ → **B**

7) Compute the limit as $x \to -\infty$ of $f(x)$.

Answer: A 1 B -1 C 0 D $+\infty$ E $-\infty$ → **C**

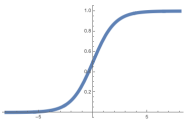
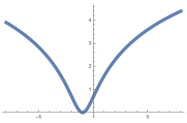
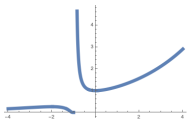
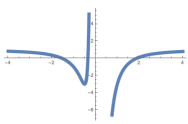
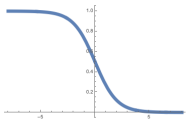
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x=0$.

Answer: A $-\frac{2}{e^3}$ B 0 C $e^{11/4}$ D $4e^2$ E $-\frac{e^{3/2}}{2}$ → **B**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = \frac{1}{2}\left(\sqrt{2}-1\right)$ B $x = 0$ C $x = -\frac{3}{2}$ D $x = \frac{1}{2}\left(2+\sqrt{2}\right)$ E $x = -2$ → **B**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **C**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **26**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} -x - 2 \leq -2x^2 - x \\ 2x + 1 > |-2x - 1| \, . \end{cases}$$

Answer: A $-\frac{1}{3} < x \leq 1 + \sqrt{2}$ B $1 - \sqrt{2} \leq x < 0$ C No x D $x = 1$ E $x > -\frac{1}{3}$ → **C**

2) Compute all solutions of the inequality $|x - 1| + x - 1 \leq x^2$.

Answer: A $x \leq \frac{1}{6}\left(-1 - \sqrt{13}\right)$ or $x \geq \frac{1}{6}\left(\sqrt{13} - 1\right)$ B $x \leq \frac{1}{2}\left(-3 - \sqrt{21}\right)$ or $x \geq \frac{1}{2}\left(\sqrt{21} - 3\right)$ → **D**
C $\frac{1}{2}\left(-3 - \sqrt{29}\right) \leq x \leq \frac{1}{2}\left(1 + \sqrt{5}\right)$ D All $\mathbf{R}$ E $x \leq \frac{1}{2}\left(-5 - \sqrt{21}\right)$ or $x \geq \frac{1}{2}\left(\sqrt{21} - 5\right)$

3) Compute the limit $\lim_{x \to 0+} \dfrac{e^{-3x^2 - x} - 1}{9x}$.

Answer: A 1 B $\frac{1}{3}$ C Does not exist D $\frac{1}{9}$ E -1 F $-\frac{1}{9}$ → **F**

4) Compute the limit $\lim_{x \to 0-} \dfrac{\log(x + 1)}{\sin(3x)}$.

Answer: A Does not exist B $\frac{5}{3}$ C 3 D 1 E $-\frac{1}{3}$ F $\frac{1}{3}$ → **F**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = \left(x^2 - 1\right) \sin\left(2x - \frac{\pi}{2}\right).$$

Answer: A -3 B 1 C 0 D -2 E -1 → **C**

6) Find the domain of definition of the function

$$f(x) = \frac{2}{3x + 1} + \log(2 - x).$$

Answer: A $x \leq 0$ B $x < -\frac{1}{3}$ or $-\frac{1}{3} < x < 3$ C $x < -\frac{1}{3}$ or $-\frac{1}{3} < x < 2$ D $-3 < x < -\frac{1}{3}$ or $x > -\frac{1}{3}$ E All $\mathbb{R}$ → **C**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: A 1 B -1 C Does not exist D 0 E $-\infty$ → **C**

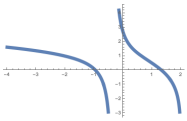
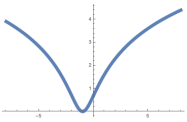
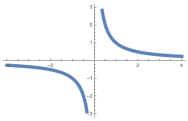
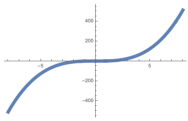
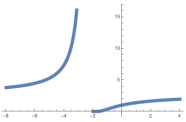
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $-\frac{13}{2}$ B $-\frac{19}{3}$ C $\frac{14}{11}$ D $-\frac{1}{6}$ E $-\frac{7}{3}$ → **A**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = \frac{1}{6}\left(-3 - \sqrt{29}\right)$ B Noo C $x = \frac{1}{2}\left(-3 - \sqrt{17}\right)$ D $x = \frac{1}{2}\left(\sqrt{5} - 1\right)$ E $x = \frac{1}{6}\left(\sqrt{21} - 1\right)$ → **B**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  → **A**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **27**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x-1| > 2x-2 \\ 2x > x^2+x+2. \end{cases}$$

Answer: A $x < -\sqrt{\frac{2}{3}}$ or $\sqrt{\frac{2}{3}} < x < 3$ B $-\frac{5}{3} < x < \frac{1}{6}\left(-3-\sqrt{21}\right)$ or $x > \frac{1}{6}\left(\sqrt{21}-3\right)$ →**D**
C $-5 < x < -1$ or $x > 0$ D No x E $x < -\frac{4}{3}$ or $0 < x < \frac{5}{3}$

2) Compute all solutions of the inequality $|x+1| + x - 3 \leq -x^2$.

Answer: A $\frac{1}{2}\left(1-\sqrt{13}\right) \leq x \leq \frac{1}{2}\left(\sqrt{5}-3\right)$ B $-2 \leq x \leq \sqrt{3}-1$ C $x \leq -\frac{4}{3}$ or $x \geq \frac{1}{3}\left(\sqrt{7}-1\right)$ D No x →**B**
E $x = -1$

3) Compute the limit $\lim_{x\to 0} \dfrac{e^x - \cos(3x)}{3x}$.

Answer: A $-\frac{5}{3}$ B $\frac{5}{3}$ C $\frac{5}{9}$ D Does not exist E 1 F $\frac{1}{3}$ →**F**

4) Compute the limit $\lim_{x\to 0} \dfrac{x^3+2x^2}{1-\cos(7x)}$.

Answer: A $\frac{4}{49}$ B $\frac{4}{9}$ C $\frac{4}{25}$ D 4 E 2 F Does not exist →**A**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = (-2x+2)\log\left(\frac{1}{2x+1}\right).$$

Answer: A 8 B -4 C -1 D 6 E -8 →**B**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{-x}}{-3x^2-2x+1}.$$

Answer: A $x \neq \frac{1}{2}\left(-1-\sqrt{3}\right)$ and $x \neq \frac{1}{2}\left(\sqrt{3}-1\right)$ B $x \neq -1$ and $x \neq \frac{1}{3}$ C $x \neq \frac{1}{2}\left(1-\sqrt{5}\right)$ and $x \neq \frac{1}{2}\left(1+\sqrt{5}\right)$ →**B**
D $x \neq -\frac{1}{2}$ and $x \neq 1$ E All $\mathbb{R}$

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: A $+\infty$ B $\frac{1}{3}$ C $-\frac{1}{3}$ D $-\frac{1}{2}$ E 0 →**E**

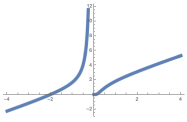
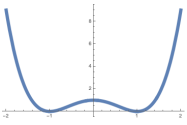
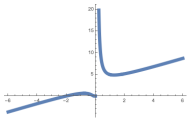
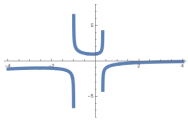
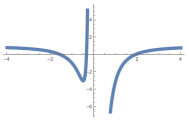
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $\frac{2}{5}$ B $\frac{2}{9}$ C 1 D $\frac{1}{6}$ E -2 →**C**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = \frac{1}{2}\left(1-\sqrt{3}\right)$ B $x = \frac{1}{2}\left(\sqrt{3}-3\right)$ C $x = \frac{1}{2}\left(\sqrt{7}-3\right)$ D $x = \frac{1}{3}\left(\sqrt{13}-4\right)$ E $x = \frac{1}{3}\left(2-\sqrt{13}\right)$ →**D**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  →**D**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **28**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |x-1| > 1-2x \\ x > x^2 + x. \end{cases}$$

Answer: [A] $x > \frac{2}{3}$ [B] $2-\sqrt{6} < x < 2+\sqrt{6}$ [C] $x < \frac{1}{3}\left(-2-\sqrt{7}\right)$ or $\frac{1}{3}\left(\sqrt{7}-2\right) < x < 1$ [D] No x [E] $-3 < x < -\frac{1}{\sqrt{3}}$ or $x > \frac{1}{\sqrt{3}}$ → **D**

2) Compute all solutions of the inequality $-|x-3| - x + 1 > -3x^2$.

Answer: [A] $-1-\sqrt{5} < x < \sqrt{5}-1$ [B] $x < -\sqrt{\frac{2}{3}}$ or $x > \sqrt{\frac{2}{3}}$ [C] $x < -4$ or $x > 2$ [D] $x < \frac{1}{3}\left(-1-\sqrt{31}\right)$ or $x > \frac{1}{3}\left(\sqrt{31}-1\right)$ [E] $\frac{1}{2}\left(-3-\sqrt{13}\right) < x < \frac{1}{2}\left(\sqrt{13}-3\right)$ → **B**

3) Compute the limit $\lim_{x\to 0+} \dfrac{x-x^2}{-x+e^x-1}$.

Answer: [A] Does not exist [B] ∞ [C] -1 [D] $-\frac{1}{2}$ [E] 1 [F] $\frac{1}{2}$ → **B**

4) Compute the limit $\lim_{x\to 0-} \dfrac{x^3-3x^2}{\sin(3x^2)}$.

Answer: [A] -3 [B] $\frac{1}{3}$ [C] $\frac{3}{5}$ [D] -1 [E] Does not exist [F] $-\frac{1}{3}$ → **D**

5) Compute the value $f'(0)$ of the derivative in $x=0$ for the function

$$f(x) = \left(1-x^2\right)\cos(x+\pi).$$

Answer: [A] -1 [B] -2 [C] 0 [D] 1 [E] 3 → **C**

6) Find the domain of definition of the function

$$f(x) = \frac{e^{-x^2-2x+1}}{3x-1}.$$

Answer: [A] $x > 0$ [B] $x \neq -\frac{1}{3}$ [C] All $\mathbb{R}$ [D] $x \neq \frac{1}{3}$ [E] $x \neq 0$ → **D**

7) Compute the limit as $x \to \frac{1}{3}-$ of $f(x)$.

Answer: [A] $-\infty$ [B] -1 [C] 0 [D] 1 [E] $+\infty$ → **A**

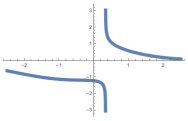
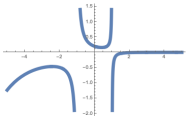
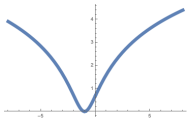
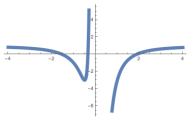
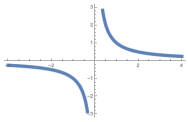
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x=0$.

Answer: [A] $-4e$ [B] 0 [C] $-e$ [D] $-2e$ [E] $3e$ → **C**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = \frac{3}{2}$ [B] $x = \frac{1}{2}\left(2+\sqrt{2}\right)$ [C] $x = \frac{1}{2}\left(-2-\sqrt{2}\right)$ [D] Noo [E] $x = 1$ → **D**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  → **A**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **29**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |1-x| > 2x-2 \\ x > -3x^2 - 2x. \end{cases}$$

Answer: [A] $x < \frac{1}{6}\left(-3-\sqrt{33}\right)$ [B] $x > \frac{2}{3}$ [C] $-5 < x < -\frac{4}{3}$ or $x > 0$ [D] $x < -1$ or $0 < x < 1$ [E] $x < \frac{1}{3}\left(-2-\sqrt{7}\right)$ or $\frac{1}{3}\left(\sqrt{7}-2\right) < x < 5$ → **D**

2) Compute all solutions of the inequality $3x^2 < 2 + x + |2x+1|$.

Answer: [A] $\frac{1}{8}\left(-1-\sqrt{33}\right) < x < \frac{1}{8}\left(\sqrt{33}-1\right)$ [B] $\frac{1}{8}\left(3-\sqrt{89}\right) < x < \frac{1}{8}\left(3+\sqrt{89}\right)$ [C] $\frac{1}{4}\left(-3-\sqrt{33}\right) < x < \frac{1}{4}\left(\sqrt{33}-3\right)$ [D] $-\frac{2}{3} < x < 1$ [E] $\frac{1}{6}\left(-1-\sqrt{13}\right) < x < \frac{1}{2}\left(1+\sqrt{5}\right)$ → **E**

3) Compute the limit $\lim_{x\to 0} -\dfrac{e^{3x}-\cos(x)}{9x}$.

Answer: [A] $\frac{1}{9}$ [B] $\frac{1}{3}$ [C] -1 [D] $-\frac{1}{3}$ [E] $\frac{5}{9}$ [F] Does not exist → **D**

4) Compute the limit $\lim_{x\to 0-} \dfrac{\sin\left(x^2+2x\right)}{7x-x^3}$.

Answer: [A] Does not exist [B] $\frac{1}{5}$ [C] $\frac{1}{7}$ [D] $\frac{2}{7}$ [E] $\frac{2}{5}$ [F] $\frac{1}{3}$ → **D**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = -\cos\left(x\exp(2x) - \frac{\pi}{2}\right).$$

Answer: [A] 0 [B] 4 [C] -4 [D] -1 [E] 2 → **D**

6) Find the domain of definition of the function

$$f(x) = e^{2x+\frac{1}{1-x}+2}.$$

Answer: [A] $x \neq 1$ [B] $x \neq -\frac{1}{7}$ [C] $x \neq -\frac{2}{9}$ [D] $x \neq \frac{5}{9}$ [E] $x \neq -\frac{1}{2}$ → **A**

7) Compute the limit as $x \to +\infty$ of $f(x)$.

Answer: [A] $+\infty$ [B] $-\infty$ [C] 1 [D] -1 [E] 0 → **A**

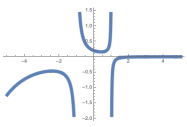
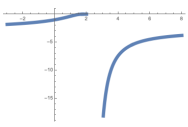
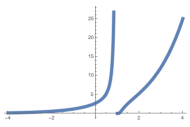
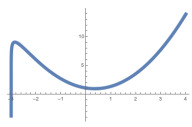
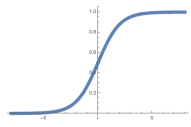
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: [A] $-\frac{9}{4e^{3/2}}$ [B] $-4e$ [C] $-4e^{9/4}$ [D] $-\frac{5}{2e^{3/2}}$ [E] $3e^3$ → **E**

9) Which are the points of minimum of $f(x)$?

Answer: [A] $x = 3$ [B] $x = \frac{3}{2}$ [C] Noo [D] $x = -\frac{3}{2}$ [E] $x = -2$ → **C**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: [A]  [B]  [C]  [D]  [E]  → **C**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI
Calculus, Unit 1 (Piero D'Ancona)
Test of xx January 2020 - Second Part

Family name: First name: Matr.no.: **30**

For each question, choose ONE answer and write ONLY the letter of that answer at the end of the arrow

1) Compute all solutions of the system of inequalities

$$\begin{cases} |3-x| > -2x-2 \\ 2x > x^2+x-2. \end{cases}$$

Answer: A $x < -\frac{1}{\sqrt{3}}$ or $\frac{1}{\sqrt{3}} < x < 1$ B $x < -1$ or $0 < x < 5$ C $-1 < x < 2$ D $x < -1$ or $0 < x < \frac{2}{3}$ E $2-\sqrt{6} < x < \frac{2}{3}$ →**C**

2) Compute all solutions of the inequality $-3\,|x-3| - 3x - 1 \le 2x^2$.

Answer: A $0 \le x \le 2$ B $x \le \frac{1}{3}\left(-2-\sqrt{10}\right)$ or $x \ge \frac{1}{3}\left(\sqrt{10}-2\right)$ C $x \le \frac{1}{2}\left(-3-\sqrt{5}\right)$ or $x \ge \frac{1}{2}\left(\sqrt{5}-3\right)$ D All **R** E $x = 3$ →**D**

3) Compute the limit $\lim_{x\to 0+} \dfrac{\sin(x)}{e^{-x}-1}$.

Answer: A Does not exist B $\frac{1}{3}$ C $\frac{5}{3}$ D $-\frac{1}{3}$ E -1 F 3 →**E**

4) Compute the limit $\lim_{x\to 0} \dfrac{x^3+2x^2}{1-\cos(5x)}$.

Answer: A $\frac{2}{9}$ B $\frac{4}{49}$ C $\frac{2}{25}$ D $\frac{4}{25}$ E 4 F Does not exist →**D**

5) Compute the value $f'(0)$ of the derivative in $x = 0$ for the function

$$f(x) = 2x \exp\left(-\frac{2x}{2x+1}\right).$$

Answer: A 2 B -2 C 1 D 0 E -1 →**A**

6) Find the domain of definition of the function

$$f(x) = \frac{2x^2+1}{1-x}.$$

Answer: A $x \neq 1$ B $x \ge 0$ C $x \neq -1$ D $x \neq 0$ E $x \neq -\frac{1}{3}$ →**A**

7) Compute the limit as $x \to 1+$ of $f(x)$.

Answer: A -1 B $-\infty$ C 1 D 0 E $+\infty$ →**B**

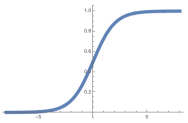
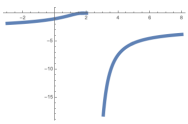
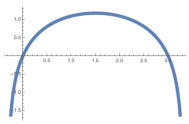
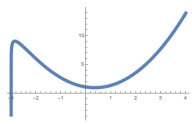
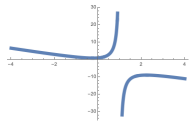
8) Compute the value $f'(0)$ of the derivative of $f(x)$ in $x = 0$.

Answer: A $-\frac{5}{4}$ B 2 C 4 D 1 E $-\frac{3}{4}$ →**D**

9) Which are the points of minimum of $f(x)$?

Answer: A $x = \frac{1}{3}$ B $x = 0$ C $x = 1$ D $x = \frac{1}{2}\left(2-\sqrt{6}\right)$ E $x = 1-\sqrt{2}$ →**D**

10) Which of the following graphs is closer to the graph of $f(x)$?

Answer: A  B  C  D  E  →**E**

BONUS

Facoltà di Ingegneria dell'informazione, Informatica e Statistica - ACSAI

Calculus, Unit 1 (Piero D'Ancona)

Test of xx January 2020 - Second Part

SOLUZIONI

↓Testo\Domanda→	1	2	3	4	5	6	7	8	9	10
I	E	C	A	B	E	A	E	C	E	E
II	D	E	B	F	E	C	D	B	D	C
III	B	C	F	F	A	A	E	D	E	A
IV	C	D	A	C	B	B	E	D	B	B
V	D	A	B	F	C	D	E	E	A	B
VI	C	B	F	D	C	C	B	D	D	C
VII	D	E	C	A	D	E	A	A	C	B
VIII	A	C	B	D	A	A	D	C	A	B
IX	B	B	B	C	B	E	D	C	B	A
X	E	E	A	E	A	E	A	B	C	B
XI	C	C	B	D	D	C	A	D	B	B
XII	B	B	B	F	B	A	B	D	D	D
XIII	C	D	D	E	B	A	A	D	A	E
XIV	B	D	A	E	B	C	E	B	D	E
XV	E	E	B	E	C	D	B	D	A	A
XVI	A	A	F	A	A	A	D	B	B	C
XVII	C	D	F	B	E	C	E	B	D	D
XVIII	B	E	D	F	C	A	D	A	A	E
XIX	A	D	C	B	C	D	E	B	A	C
XX	E	D	C	F	E	D	A	B	A	B
XXI	D	A	B	D	B	B	B	C	E	C
XXII	E	D	D	E	A	D	C	C	B	C
XXIII	A	C	E	E	D	E	A	D	B	E
XXIV	E	A	B	E	B	B	B	C	A	D
XXV	C	C	E	E	A	B	C	B	B	C
XXVI	C	D	F	F	C	C	C	A	B	A
XXVII	D	B	F	A	B	B	E	C	D	D
XXVIII	D	B	B	D	C	D	A	C	D	A
XXIX	D	E	D	D	D	A	A	E	C	C
XXX	C	D	E	D	A	A	B	D	D	E