Lecture Three Practice

Practice problems

Abstract. *Practice problems for Lecture Three Content*

Problem. 1 : Determine if the limit approaches a finite number, ∞, $-\infty$, or does not exist. (If the limit does not exist, write DNE)

$$\lim_{x \to -1} \frac{-5x^3 - 5}{x^2 - 5x - 6} = \boxed{} \quad \boxed{?}$$

Problem. 2 : Determine if the limit approaches a finite number, ∞, $-\infty$, or does not exist. (If the limit does not exist, write DNE)

$$\lim_{x \to -\infty} \frac{x^2 + 6x + 9}{x^2 + 6x + 9} = \boxed{} \quad \boxed{?}$$

Problem. 3 : Use the function to answer the following questions.

$$f(x) = \begin{cases} \sqrt{x^2 + 5} - 12 & -\infty < x \leq 2 \\ \dfrac{x^2 - 13x + 22}{x - 2} & 2 < x < \infty \end{cases}$$

The function is ...

continuous at $x = 2$.
discontinuous at $x = 2$.

? Check work

Problem. 4 : Determine if the limit approaches a finite number, ∞, $-\infty$, or does not exist. (If the limit does not exist, write DNE)

$$\lim_{x \to -4} 4\left(x^3 - 8x^2 + 20x - 16\right) \tan(\pi x) = \boxed{} \quad \boxed{?}$$

Problem. 5 : Calculate the following limit:

$$\lim_{x \to 1} \frac{4\left(x^2 - 1\right)}{x - 1} = \boxed{} \quad \boxed{?}$$

Problem. 6 : Compute the following limit:

$$\lim_{x \to 4} \frac{3(\ln(9x + 10) + 1)}{4\left((2x + 2)^{\frac{1}{3}} + 1\right)} = \boxed{} \quad \boxed{?}$$

Problem. 7 : Calculate the following limit:

$$\lim_{x \to 2} (x - 2) \cos(\ln(|x - 2|)) = \boxed{} \quad \boxed{?}$$

Problem. 8 : Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exist, enter DNE.)

$$\lim_{x \to -2} -7x^3 - 2x^2 + x + 5 = \boxed{} \quad \boxed{?}$$

Problem. 9 : Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exist, enter DNE.)

$$\lim_{x \to 0} \frac{x^2 + 2x - 48}{x^2 + x - 2} = \boxed{} \quad \boxed{?}$$

Problem. 10 :

Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exist, enter DNE.)

$$\lim_{x \to 0} \sqrt{-2x^3 - 5x^2 + 2x + 2} = \boxed{} \quad \boxed{?}$$

Problem. 11 : Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exist, enter DNE.)

$$\lim_{x \to 1} -\left(7x^2 - 5x - 4\right)\left(x^{\frac{1}{3}} + 8\right) = \boxed{} \quad \boxed{?}$$

Problem. 12 : Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exist, enter DNE.)

$$\lim_{x \to -8} \frac{-5x - 40}{|x + 8|} = \boxed{} \quad \boxed{?}$$

Problem. 13 : Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exist, enter DNE.)

$$\lim_{x \to -5} \frac{-8|x| + 40}{2x + 10} = \boxed{} \quad \boxed{?}$$

Problem. 14 : How would you "remove the discontinuity" of f? In other words, how would you define $f(5)$ in order to make f continuous at 5?

$$f(x) = \frac{x^2 + 4x - 45}{x - 5}$$

$f(5) =$ [ ] ❓

Problem. 15 : Use continuity to evaluate the limit.

$$\lim_{x \to 8} (-5x + 9) \sqrt{68 - x^2} =$$ [ ] ❓

Problem. 16 : Use continuity to evaluate the limit.

$$\lim_{x \to 1} e^{\left(-9x^5 - 4x^4 - 3x^2\right)} =$$ [ ] ❓

Problem. 17 : Does the Intermediate Value Theorem hold for the function

$$f(x) = \begin{cases} 10(x - 4)^3 - 2 & -\infty < x < 5 \\ (x - 4)^{\frac{1}{7}} + 7 & 5 \le x < \infty \end{cases}$$

Over the interval $[0, 7]$?

Yes
No	? Check work

Problem. 18 : Does the Intermediate Value Theorem hold for the function

$$f(x) = \begin{cases} 4e^{x-5} - 3 & -\infty < x < 5 \\ 3e^{x-5} - 3 & 5 \le x < \infty \end{cases}$$

Over the entire interval $[-3, 11]$?

Yes
No	? Check work

Problem. 19 : Let

$$f(x) = \begin{cases} (x-2)^2 - 22 & -\infty < x \le -3 \\ x + 5 & -3 < x \le -1 \\ x^2 - 2x + 1 & -1 < x < \infty \end{cases}$$

Find the numbers at which f is discontinuous:

$x =$ [____] [?] (If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the right?

$x =$ [_____] [?] (If no such numbers exist, enter "None")

At which of these points of discontinuity is f continuous from the left?

$x =$ [____] [?] (If no such numbers exist, enter "None")

Problem. 20 : Let $f(x) = \begin{cases} (x-1)^2, & x < 1 \\ \sin(x), & 1 \le x \le 3 \\ x^2 - 2x + 1, & x > 3 \end{cases}$.

Find the numbers at which f is discontinuous (list your answers from lowest to highest and enter "None" in any box remaining after all answers are entered):

$x =$ [____] [?] $x =$ [____] [?]

At which of these points of discontinuity is f continuous from the right? (List your answers from lowest to highest and enter "None" in any box remaining after all answers are entered):

$x =$ [____] [?] $x =$ [_____] [?]

At which of these points of discontinuity is f continuous from the left? (List your answers from lowest to highest and enter "None" in any box remaining after all answers are entered):

$x =$ [____] [?] $x =$ [_____] [?]

Problem. 21 :

Does $3x^3 - 15x^2 - 12x + 60$ have a root in the interval $(1, 4)$?

Yes	
No	
Inconclusive	? Check work

Problem. 22 :

Does the equation $\sin(x - 4) = -x + 13$ have a solution in the interval $(4, 13)$?

Yes	
No	
Inconclusive	? Check work