# Math 131 - Assignment 1

January 17, 2024

Name ___Key___

Score _____

Show all work to receive full credit. Supply explanations when necessary. This assignment is due January 24.

1. Use a table of numerical values to estimate the limit. Your table must show function values at six or more points.

$f(x) = \dfrac{7^x - 1}{x}$    $\lim\limits_{x \to 0} \dfrac{7^x - 1}{x} \approx \boxed{1.946}$

| X | 0.1 | 0.01 | 0.001 | 0.0001 | -0.01 | -0.001 | -0.0001 |
|---|------|------|-------|--------|-------|--------|---------|
| f(x) | 2.1481 | 1.965 | 1.9478 | 1.9461 | 1.9271 | 1.944 | 1.9457 |

2. Use a table of numerical values to estimate the limit. Your table must show function values at six or more points.

$f(x) = \dfrac{|1 - x^2|}{x - 1}$    $\lim\limits_{x \to 1} \dfrac{|1 - x^2|}{x - 1}$  $\boxed{DNE}$

LIMIT FROM LEFT = -2

LIMIT FROM RIGHT = 2

| X | 0.9 | 0.99 | 0.999 | 1.1 | 1.01 | 1.001 |
|---|------|------|-------|------|------|-------|
| f(x) | -1.9 | -1.99 | -1.999 | 2.1 | 2.01 | 2.001 |

3. Use a table of numerical values to estimate the limit. Your table must show function values at six or more points.

$f(x) = \dfrac{x + 3}{(x - 5)^2}$    $\lim\limits_{x \to 5} \dfrac{x + 3}{(x - 5)^2}$  $\boxed{DNE}$

FUNCTION VALUES ARE growing WITHOUT BOUND.

| X | 4.9 | 4.99 | 4.999 | 5.1 | 5.01 | 5.001 |
|---|------|------|-------|------|------|-------|
| f(x) | 790 | 79900 | ≈ 8,000,000 | 810 | 80,100 | ≈ 8,000,000 |

4. In your own words, describe the meaning of the statement $\lim\limits_{x \to -3} f(x) = 9$.

IT MEANS THE VALUES OF $f(x)$ CAN BE MADE ARBITRARILY CLOSE TO 9 BY CHOOSING X CLOSE ENOUGH TO -3.

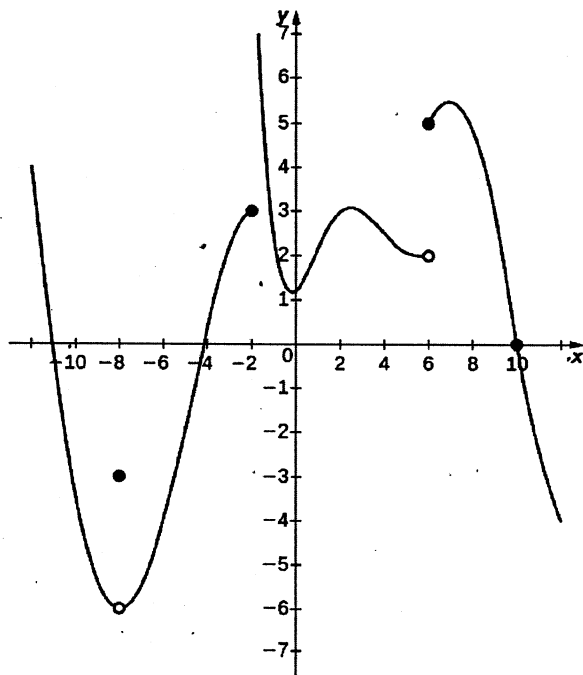5. Carefully explain why the limit does not exist: $\lim\limits_{x \to 0} x \ln x$.

↑ TWO SIDED LIMIT, BUT $\ln$ X IS NOT DEFINED TO THE LEFT OF X = 0.

*Turn over.*

6. Referring to the graph of $y = f(x)$ shown below, determine each of the following or explain why it does not exist.



(a) $\lim_{x \to -8} f(x) = -6$

(b) $f(6) = 5$

(c) $\lim_{x \to 0} f(x) \approx 1.2$

(d) $\lim_{x \to 6} f(x)$ DNE BECAUSE LIMIT FROM LEFT $= 2 \neq 5 =$ LIMIT FROM RIGHT

7. Find the limit analytically by using limit laws. Show all steps.

$$\lim_{x \to 3} 2x(x+4) = \left( \lim_{x \to 3} 2 \right)\left( \lim_{x \to 3} x \right)\left[ \lim_{x \to 3} x + \lim_{x \to 3} 4 \right]$$

$$= (2)(3)(3+4) = 6 \cdot 7 = \boxed{42}$$

8. Suppose $\lim_{x \to 5} f(x) = 4$ and $\lim_{x \to 5} g(x) = 11$. Use limit laws to find the limit below. Show all steps.

$$\lim_{x \to 5} \left[ \frac{x f(x)}{7 g(x)} \right]$$

$$= \frac{\lim_{x \to 5} x \cdot \lim_{x \to 5} f(x)}{\lim_{x \to 5} 7 \cdot \lim_{x \to 5} g(x)} = \frac{5 \cdot 4}{7 \cdot 11} = \boxed{\frac{20}{77}}$$