

**MATH 151- WEEK-IN-REVIEW 3**

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**PROBLEM STATEMENTS**

1. Find the following limits:

(a)  $\lim_{x \rightarrow 2} (3x^3 - 5x + 4)$

(b)  $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x + 1}$

(c)  $\lim_{x \rightarrow 0} \frac{\sqrt{5-t} - \sqrt{5}}{t}$



$$(d) \lim_{x \rightarrow 3^+} \frac{|3 - x|}{x - 3}$$

$$(e) \lim_{x \rightarrow 3^-} \frac{|3 - x|}{x - 3}$$

$$(f) \lim_{x \rightarrow 3} \frac{|3 - x|}{x - 3}$$



2. Let  $f(x) = \begin{cases} x + 3 & \text{if } x < 0 \\ -x^2 & \text{if } 0 < x < 4 \\ 4x & \text{if } x > 4 \end{cases}$  and evaluate each of the following limits if they exist.

(a)  $\lim_{x \rightarrow 0^-} f(x)$

(b)  $\lim_{x \rightarrow 0^+} f(x)$

(c)  $\lim_{x \rightarrow 0} f(x)$

(d)  $\lim_{x \rightarrow 2} f(x)$

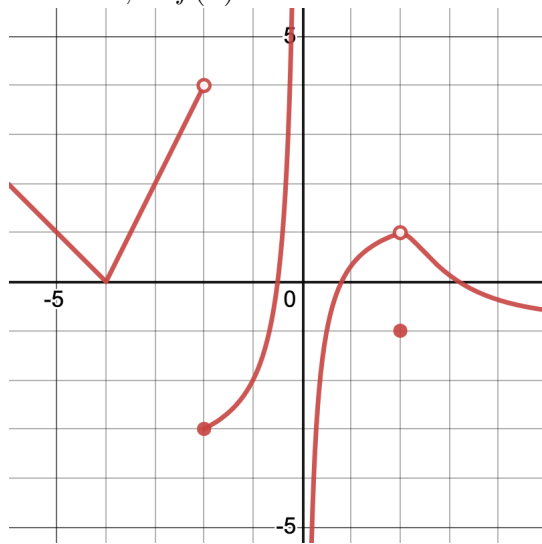
(e)  $\lim_{x \rightarrow 4^-} f(x)$

(f)  $\lim_{x \rightarrow 4^+} f(x)$

(g)  $\lim_{x \rightarrow 4} f(x)$



3. Refer to the graph of  $f(x)$  below. Find all values of  $x$  where  $f(x)$  is discontinuous. For these values of  $x$ , is  $f(x)$  continuous from the right, left or neither? Support your answer.



4. Determine whether the following functions are continuous at the indicated value of  $x$ . Support your answer.

$$(a) f(x) = \begin{cases} \arctan(x) + 1 & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ 1 - x^3 & \text{if } x > 0 \end{cases} \text{ at } x = 0$$

$$(b) f(x) = \frac{1}{x-1} \text{ at } x = 1$$



(c)  $f(x) = \frac{x+4}{x^2+5x+4}$  at  $x = -1$  and  $x = -4$

5. Find the values of  $a$  and  $b$  that make  $f$  continuous everywhere.

$$f(x) = \begin{cases} \frac{x^2 - 1}{x + 1} & \text{if } x < 1 \\ ax^2 + bx - 5 & \text{if } 1 < x < 2 \\ 3x - a + 2b & \text{if } x > 2 \end{cases}$$

6. Evaluate the following limits.

(a)  $\lim_{x \rightarrow \infty} \frac{-10}{3x^2}$



$$(b) \lim_{x \rightarrow -\infty} \frac{x - 7}{3 + 2x^2}$$

$$(c) \lim_{x \rightarrow -\infty} \frac{x^3 - 2x}{3 - 2x^2 - 5x^3}$$

$$(d) \lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 7x + 3}}{x + 1}$$

$$(e) \lim_{x \rightarrow -\infty} \frac{\sqrt{x^2 + 7x + 3}}{x + 1}$$



$$(f) \lim_{x \rightarrow -\infty} \frac{\sqrt{4x^6 + 7x - 1}}{x^3 + 9}$$

$$(g) \lim_{x \rightarrow \infty} \frac{\sqrt{4x^6 + 7x - 1}}{x^3 + 9}$$

$$(h) \lim_{x \rightarrow \infty} e^{5-x}$$



(i)  $\lim_{x \rightarrow 5^+} e^{\frac{x}{5-x}}$

(j)  $\lim_{x \rightarrow \infty} (\ln(3x^2 + 5) - \ln(7 + 6x^2))$

(k)  $\lim_{x \rightarrow \infty} (\ln(3x^2 + 5) - \ln(7 + 6x))$