

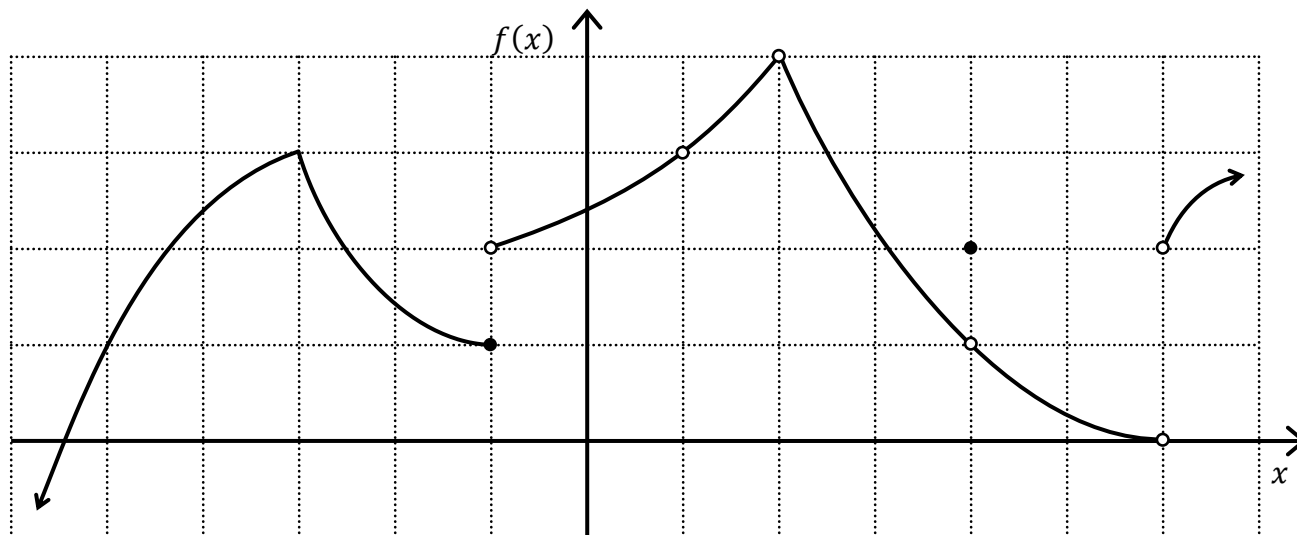
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**MATH 2301 (Barsamian) Recitation R01 Problems**

**Problem [1]: Limits for a Function Described by a Graph**



Use the graph above (and extra copies on back) to fill in the table below.

| x-value | limit from left                    | limit from right                   | limit                            | y-value   |
|---------|------------------------------------|------------------------------------|----------------------------------|-----------|
| -5      | $\lim_{x \rightarrow -5^-} f(x) =$ | $\lim_{x \rightarrow -5^+} f(x) =$ | $\lim_{x \rightarrow -5} f(x) =$ | $f(-5) =$ |
| -3      | $\lim_{x \rightarrow -3^-} f(x) =$ | $\lim_{x \rightarrow -3^+} f(x) =$ | $\lim_{x \rightarrow -3} f(x) =$ | $f(-3) =$ |
| -1      | $\lim_{x \rightarrow -1^-} f(x) =$ | $\lim_{x \rightarrow -1^+} f(x) =$ | $\lim_{x \rightarrow -1} f(x) =$ | $f(-1) =$ |
| 1       | $\lim_{x \rightarrow 1^-} f(x) =$  | $\lim_{x \rightarrow 1^+} f(x) =$  | $\lim_{x \rightarrow 1} f(x) =$  | $f(1) =$  |
| 2       | $\lim_{x \rightarrow 2^-} f(x) =$  | $\lim_{x \rightarrow 2^+} f(x) =$  | $\lim_{x \rightarrow 2} f(x) =$  | $f(2) =$  |
| 4       | $\lim_{x \rightarrow 4^-} f(x) =$  | $\lim_{x \rightarrow 4^+} f(x) =$  | $\lim_{x \rightarrow 4} f(x) =$  | $f(4) =$  |
| 6       | $\lim_{x \rightarrow 6^-} f(x) =$  | $\lim_{x \rightarrow 6^+} f(x) =$  | $\lim_{x \rightarrow 6} f(x) =$  | $f(6) =$  |

### Problem [2]: Drawing a function with specified limit properties

Sketch the graph (just one) of an example of a function that satisfies all of the given conditions:

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

### Problem [3]: Guessing a limit by plugging in values (NO CALCULATOR!)

Without using a calculator, answer the following questions about the function

$$f(x) = \frac{x^2 - 3x}{x^2 - x - 6}$$

#### Part 1: Function Values

(1) Factor  $f$ .

(2) Are you allowed to cancel factors in the factored form of  $f$ ? Explain why you think you are allowed to cancel, or why you are not.

(3) Find  $f(1)$  by substituting  $x = 1$  into the factored version of  $f$ .

(4) Find  $f(2)$  by substituting  $x = 2$  into the factored version of  $f$ .

(5) Find  $f(3)$  by substituting  $x = 3$  into the factored version of  $f$ .

## Part 2: Limit as $x \rightarrow 3$

Using the factored form of  $f$ , compute the following values and guess the limits. **(No calculators)**  
**(Simplify your expressions by cancelling when possible, but don't bother doing the division. That is, leave your answers as fractions.)**

### Guessing the Limit from the right:

(6) Find  $f(3.1)$ . **Hint:** I'll do this one for you.

$$\text{Solution: } f(3.1) = \frac{3.1(3.1 - 3)}{(3.1 + 2)(3.1 - 3)} \underset{\substack{\text{can cancel because} \\ \text{the terms are not zero}}}{=} \frac{3.1}{(3.1 + 2)} = \frac{3.1}{5.1} = \text{close to } \frac{3}{5}$$

$$(7) f(3.01) =$$

$$(9) \text{ Guess } \lim_{x \rightarrow 3^+} f(x) =$$

### Guessing the Limit from the left:

$$(10) f(2.9) =$$

$$(11) f(2.99) =$$

$$(13) \text{ Guess } \lim_{x \rightarrow 3^-} f(x) =$$

### Guessing the Limit:

$$(14) \text{ Guess } \lim_{x \rightarrow 3} f(x) =$$

**Problem [4]: Guessing a limit by plugging in values (NO CALCULATOR!)**

**Without using a calculator**, answer the following questions about the function

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

**Function Value:**

(15)  $f(3) =$

**Guessing the Limit from the right:**

(16) Find  $f(3.1)$ . **Hint:** I'll do this one for you.

**Solution:**  $f(3.1) = \frac{|3.1 - 3|}{3.1 - 3} = \frac{|0.1|}{0.1} = \frac{0.1}{0.1} = 1$   
can cancel because the terms are not zero

(17)  $f(3.01) =$

(19) Guess  $\lim_{x \rightarrow 3^+} f(x) =$

**Guessing the Limit from the left:**

(20)  $f(2.9) =$

(21)  $f(2.99) =$

(23) Guess  $\lim_{x \rightarrow 3^-} f(x) =$

**Guessing the Limit:**

(24) Guess  $\lim_{x \rightarrow 3} f(x) =$