

Problems for Gateway #2: Left and Right Hand Limits

1. Consider the function f defined by the equation:

$$f(x) = \begin{cases} 1 & , x > 0 \\ -1 & , x < 0 \end{cases}$$

What is the limit of f as x approaches zero?

- (a) The limit does not exist as the left and right hand limits are not equal.
- (b) The limit of f as x approaches zero is equal to 1.
- (c) The limit of f as x approaches zero is equal to -1 .
- (d) The limit of f as x approaches zero is equal to ± 1 .
- (e) The limit of f as x approaches zero is equal to 0.

2. Consider the function f defined by the equation:

$$f(x) = \begin{cases} x & , x > 0 \\ -x & , x < 0 \end{cases}$$

What is the limit of f as x approaches zero?

- (a) The limit does not exist as the left and right hand limits are not equal.
- (b) The limit of f as x approaches zero is equal to 1.
- (c) The limit of f as x approaches zero is equal to -1 .
- (d) The limit of f as x approaches zero is equal to ± 1 .
- (e) The limit of f as x approaches zero is equal to 0.

3. Consider the function f defined by the equation:

$$f(x) = \begin{cases} x^2 & , x > 0 \\ 0 & , x < 0 \end{cases}$$

What is the limit of f as x approaches two?

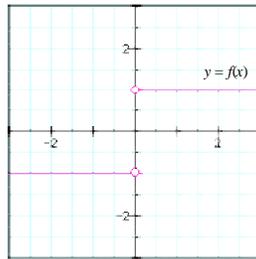
- (a) The limit of f as x approaches two is equal to 0.
- (b) The limit of f as x approaches two is equal to 4.
- (c) The limit of f as x approaches two is equal to 2.
- (d) The limit of f as x approaches two is equal to $-\infty$.
- (e) The limit does not exist as the left and right hand limits are not equal.

4. Consider the function f defined by the equation:

$$f(x) = \begin{cases} 3^x & , x \geq -1 \\ 3^{-x} & , x < -1 \end{cases}$$

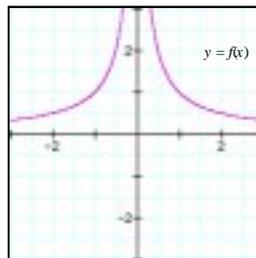
What is the limit of f as x approaches negative one?

- (a) The limit of f as x approaches negative one is equal to 3.
 - (b) The limit of f as x approaches negative one is equal to $1/3$.
 - (c) The limit of f as x approaches negative one is equal to 9.
 - (d) The limit does not exist as the left and right hand limits are not equal.
 - (e) The limit does not exist as neither function is defined at $x = -1$.
5. Consider the function f defined by the graph:



What is the limit of f as x approaches zero?

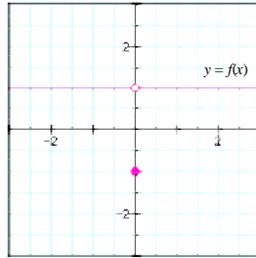
- (a) The limit of f as x approaches zero is equal to 0.
 - (b) The limit of f as x approaches zero is equal to 1.
 - (c) The limit of f as x approaches zero is equal to -1 .
 - (d) The limit of f as x approaches zero is equal to ± 1 .
 - (e) The limit does not exist as the left and right hand limits are not equal.
6. Consider the function f defined by the graph:



What is the limit of f as x approaches zero?

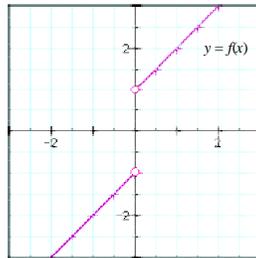
- (a) The limit does not exist as the left and right hand limits are not equal.
- (b) The limit does not exist as the function f is not defined at $x = 0$.
- (c) The limit of f as x approaches zero is equal to $+\infty$.
- (d) The limit of f as x approaches zero is equal to $\pm\infty$.
- (e) The limit of f as x approaches zero is equal to 0.

7. Consider the function f defined by the graph:



What is the limit of f as x approaches zero?

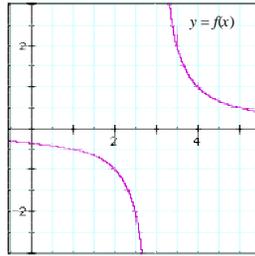
- (a) The limit does not exist as the left and right hand limits are not equal.
 - (b) The limit of f as x approaches zero is equal to -1 .
 - (c) The limit of f as x approaches zero is equal to 1 .
 - (d) The limit of f as x approaches zero is equal to $1/2$.
 - (e) The limit of f as x approaches zero is equal to 0 .
8. Consider the function f defined by the graph:



What is the limit of f as x approaches zero?

- (a) The limit of f as x approaches zero is equal to -1 .
- (b) The limit does not exist as the left and right hand limits are not equal.
- (c) The limit of f as x approaches zero is equal to -1 .
- (d) The limit of f as x approaches zero is equal to ± 1 .
- (e) The limit of f as x approaches zero is equal to 0 .

9. Consider the function f defined by the graph:



What is the limit of f as x approaches three?

- (a) The limit does not exist as the left and right hand limits are not equal.
 - (b) The limit of f as x approaches three is equal to $+\infty$.
 - (c) The limit of f as x approaches three is equal to $-\infty$.
 - (d) The limit of f as x approaches three is equal to $\pm\infty$.
 - (e) The limit of f could be $+\infty$ or $-\infty$ depending on how you approach $x = 3$.
10. Consider the function f defined by the equation:

$$f(x) = \frac{1}{x+3}$$

What is the limit of f as x approaches three?

- (a) The limit does not exist as the left and right hand limits are not equal.
- (b) The limit of f as x approaches three is equal to $+\infty$.
- (c) The limit of f as x approaches three is equal to $-\infty$.
- (d) The limit of f as x approaches three is equal to $1/6$.
- (e) The limit of f as x approaches three is equal to 0.

ANSWERS:

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|----|---|-----|---|----|---|----|---|
| 1. | A | 2. | E | 3. | B | 4. | D |
| 5. | E | 6. | C | 7. | C | 8. | B |
| 9. | A | 10. | D | | | | |