

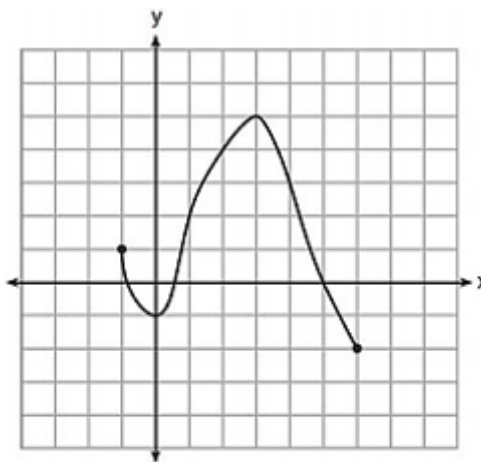


# DAY 4: CHARACTERISTICS OF LINEAR FUNCTIONS

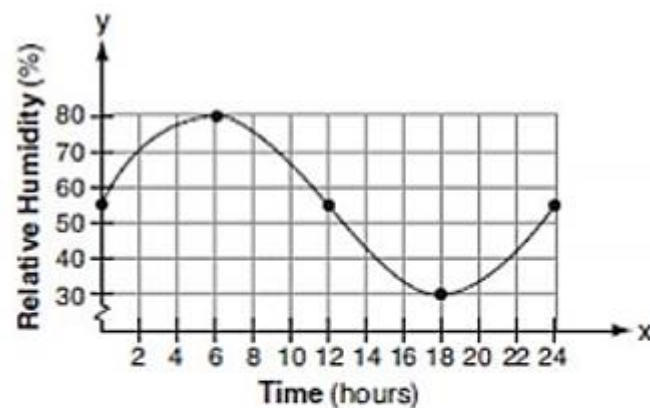
Unit 2B: Linear Functions

# DOMAIN & RANGE

Domain		
<i>Define:</i> All possible values of x	<i>Think:</i> How far left to right does the graph go?	<i>Write:</i> Smallest $x \leq x \leq$ Biggest x *use < if the circles are open*
Range		
<i>Define:</i> All possible values of y	<i>Think:</i> How far down to how far up does the graph go?	<i>Write:</i> Smallest $y \leq y \leq$ Biggest y *use < if the circles are open*



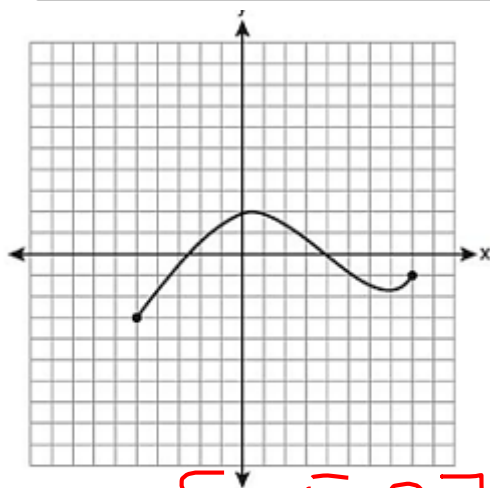
Domain:  $[-1, 6]$   
Range:  $-2 \leq y \leq 5$



Domain:  $[0, 24]$   
Range:  $30 \leq y \leq 80$

# DOMAIN & RANGE

Domain		
<i>Define:</i> All possible values of x	<i>Think:</i> How far left to right does the graph go?	<i>Write:</i> Smallest $x \leq x \leq$ Biggest x *use < if the circles are open*
Range		
<i>Define:</i> All possible values of y	<i>Think:</i> How far down to how far up does the graph go?	<i>Write:</i> Smallest $y \leq y \leq$ Biggest y *use < if the circles are open*

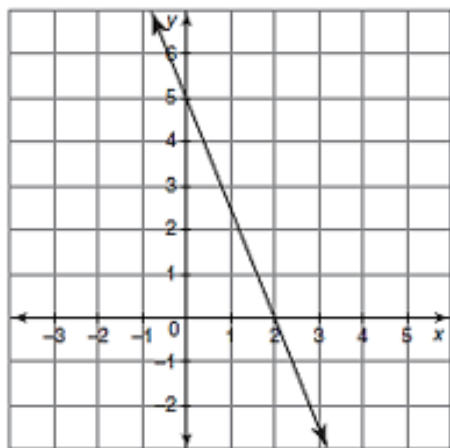


Domain:  $[-5, 8]$

Range:  $-3 \leq y \leq 2$

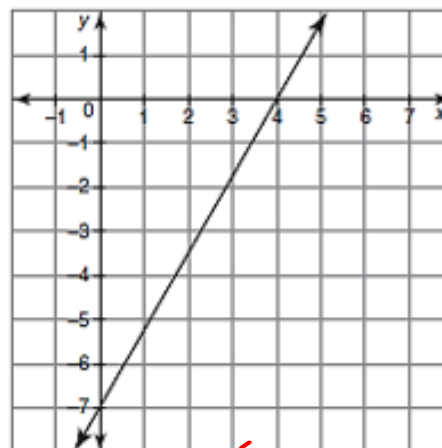
# DOMAIN & RANGE

Domain		
<p><i>Define:</i> All possible values of x</p>	<p><i>Think:</i> How far left to right does the graph go?</p>	<p><i>Write:</i> Smallest x ≤ x ≤ Biggest x *use &lt; if the circles are open*</p>
Range		
<p><i>Define:</i> All possible values of y</p>	<p><i>Think:</i> How far down to how far up does the graph go?</p>	<p><i>Write:</i> Smallest y ≤ y ≤ Biggest y *use &lt; if the circles are open*</p>



Domain:  $(-\infty, \infty)$

Range:  $(-\infty, \infty)$



Domain:  $(-\infty, \infty)$  All real #

Range:  $(-\infty, \infty)$

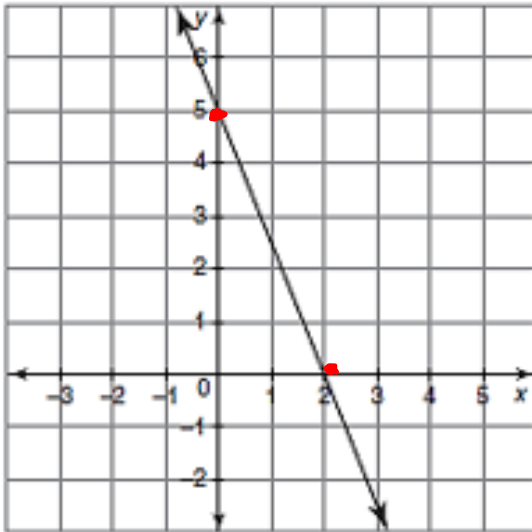
$\mathbb{R}$

# X & Y-INTERCEPTS

<i>Y-Intercept</i>		
<i>Define:</i> Point where the graph crosses the y-axis	<i>Think:</i> At what coordinate point does the graph cross the y-axis?	<i>Write:</i> (0, b)
<i>X-Intercept</i>		
<i>Define:</i> Point where the graph crosses the x-axis	<i>Think:</i> At what coordinate point does the graph cross the x-axis?	<i>Write:</i> (a, 0)
<i>Zero</i>		
<i>Define:</i> Where the function (y-value) equals 0	<i>Think:</i> At what x-value does the graph cross the x-axis?	<i>Write:</i> x = ____

# X & Y INTERCEPTS

1.

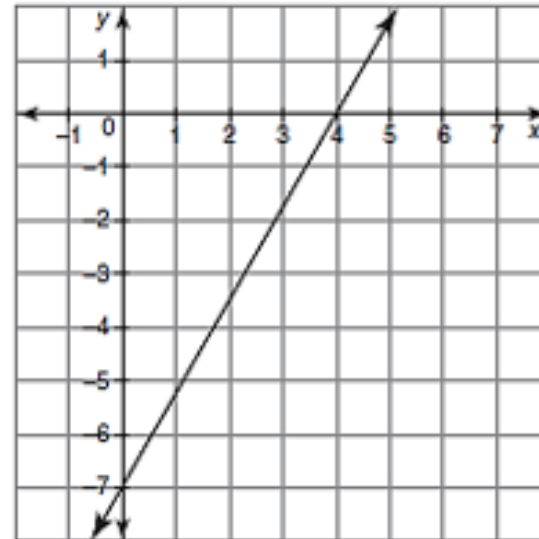


Y-intercept:  $(0, 5)$

X-intercept  $(2, 0)$

Zero:  $X = 2$

2.



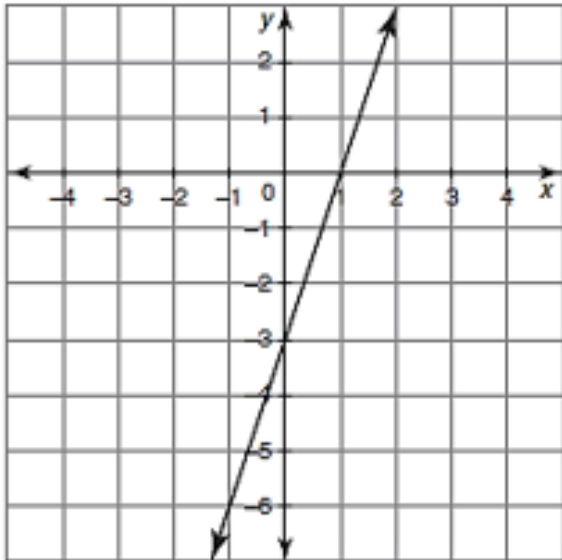
Y-intercept:  $(0, -7)$

X-intercept:  $(4, 0)$

Zero:  $X = 4$

# X & Y INTERCEPTS

3.

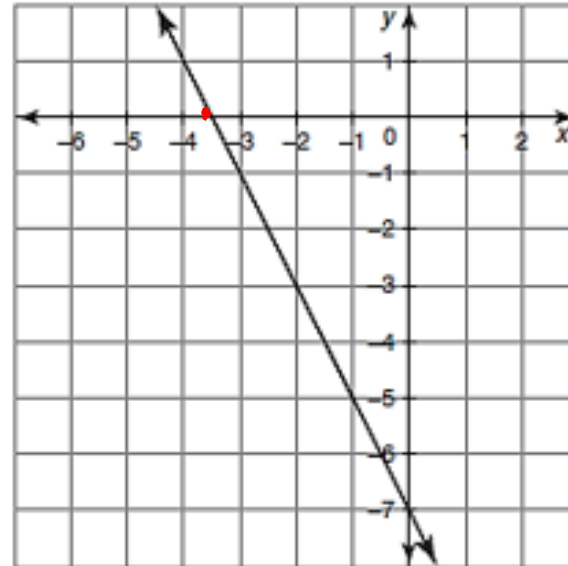


Y-intercept:  $(0, -3)$

X-intercept:  $(1, 0)$

Zero:  $X = 1$

4.



Y-intercept:  $(0, -7)$

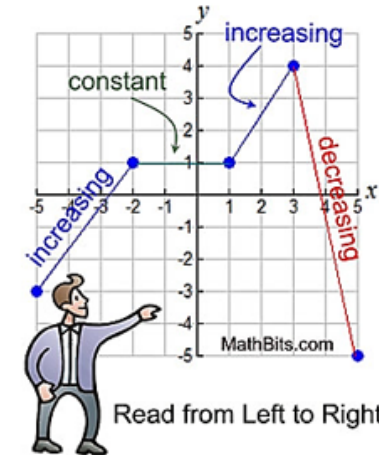
X-intercept:  $(-3.5, 0)$

Zero:  $X = -3.5$

# INTERVALS OF INCREASE & DECREASE

Interval of Increase		
<i>Define:</i> The part of the graph that is rising as you read left to right.	<i>Think:</i> From left to right, is my graph going up?	<i>Write:</i> x value where it starts increasing $< x <$ x value where it stops increasing
Interval of Decrease		
<i>Define:</i> The part of the graph that is falling as you read from left to right.	<i>Think:</i> From left to right, is my graph going down?	<i>Write:</i> x value where it starts decreasing $< x <$ x value where it stops decreasing
Interval of Constant		
<i>Define:</i> The part of the graph that is a horizontal line as you read from left to right.	<i>Think:</i> From left to right, is my graph a flat line?	<i>Write:</i> x value where it starts flat-lining $< x <$ x value where it stops flat-lining

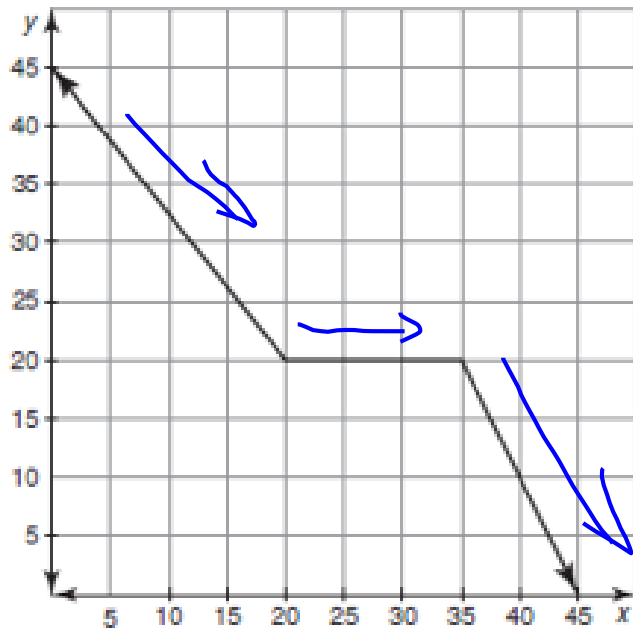
*-5 < x < -3*





# INTERVALS OF INCREASE & DECREASE

**Non Linear Example:**



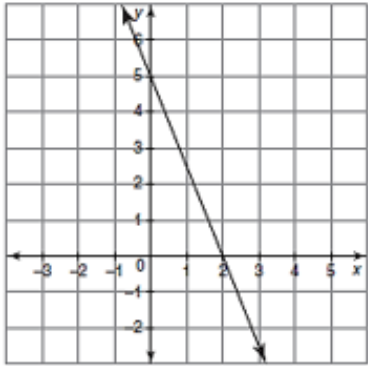
Interval of Increase: *none*

Interval of Decrease:  
 $-\infty < x < 20$  ;  $35 < x < \infty$

Interval of Constant:  $20 < x < 35$

# INTERVALS OF INCREASE & DECREASE

1.



Interval of Increase:

none

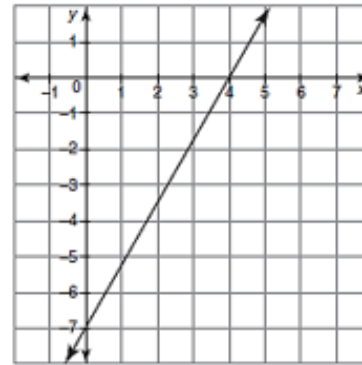
Interval of Decrease:

$-\infty < x < \infty$

Interval of Constant:

none

2.



Interval of Increase:

$-\infty < x < \infty$

Interval of Decrease:

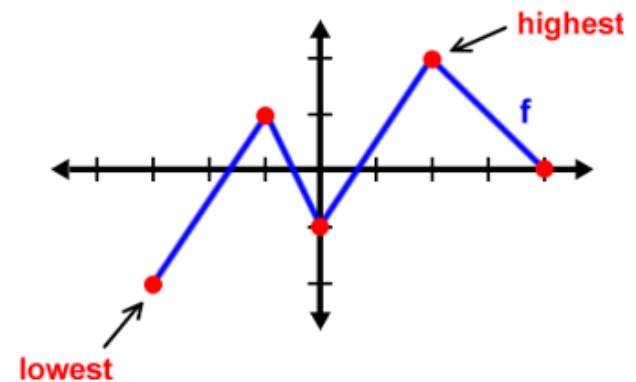
none

Interval of Constant:

none

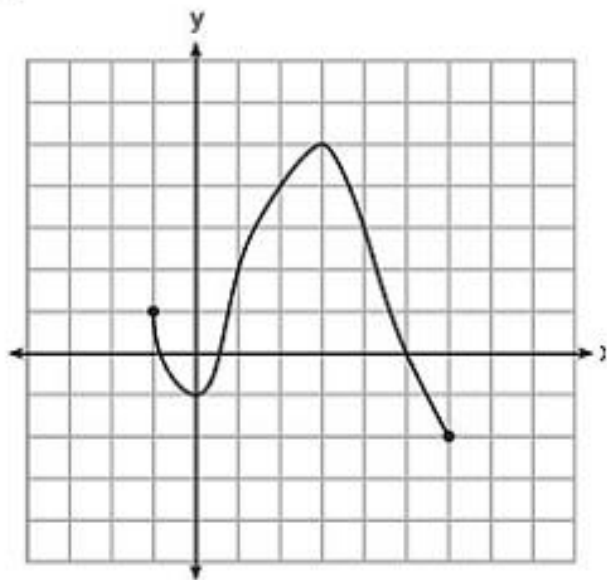
# EXTREMA

<i>Maximum</i>		
<i>Define:</i> Highest point or peak of a function.	<i>Think:</i> What is my highest point or value on my graph?	<i>Write:</i> If none, write none Otherwise, $y = \text{biggest } y\text{-value}$
<i>Minimum</i>		
<i>Define:</i> Lowest point or valley of a function.	<i>Think:</i> What is the lowest point or value on my graph?	<i>Write:</i> If none, write none Otherwise, $y = \text{smallest } y\text{-value}$



# EXTREMA

1.



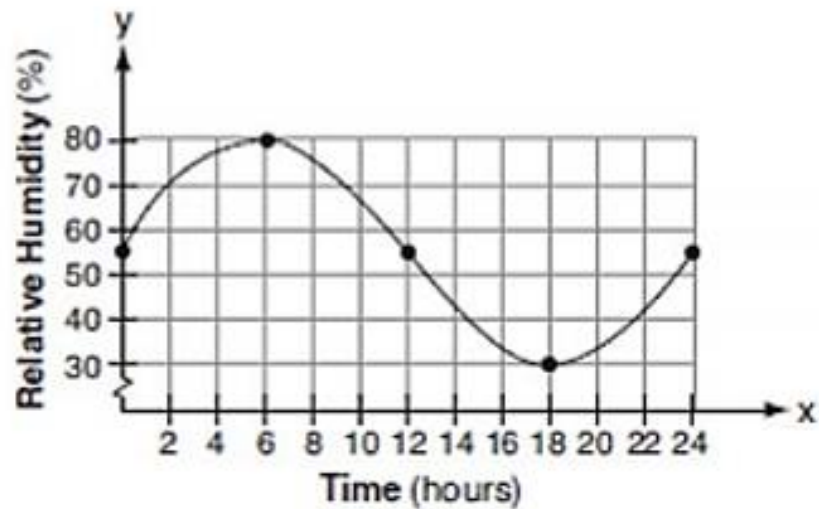
Maximum:

$$y = 5$$

Minimum:

$$y = -2$$

2.



Maximum:

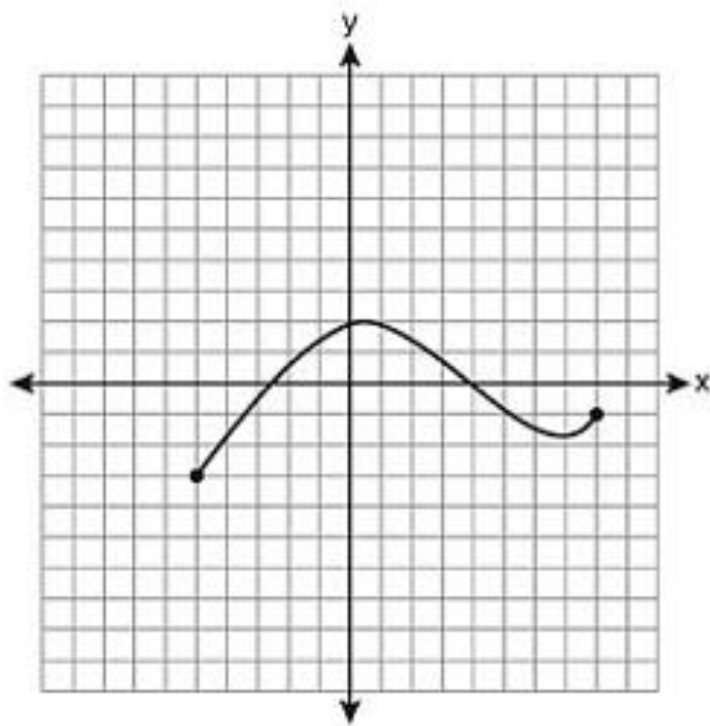
$$y = 80$$

Minimum:

$$y = 30$$

# EXTREMA

3.



Maximum:

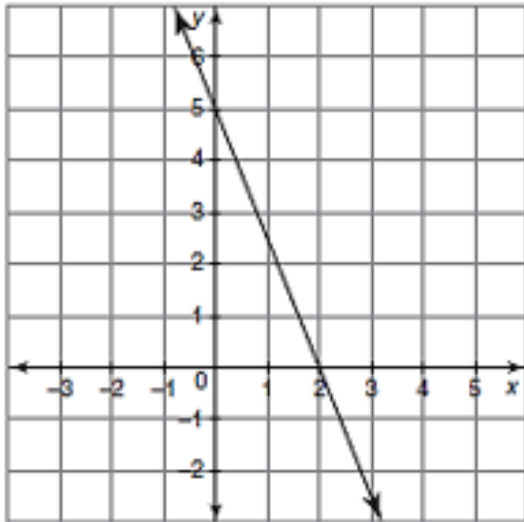
$$y = 2$$

Minimum:

$$y = -3$$

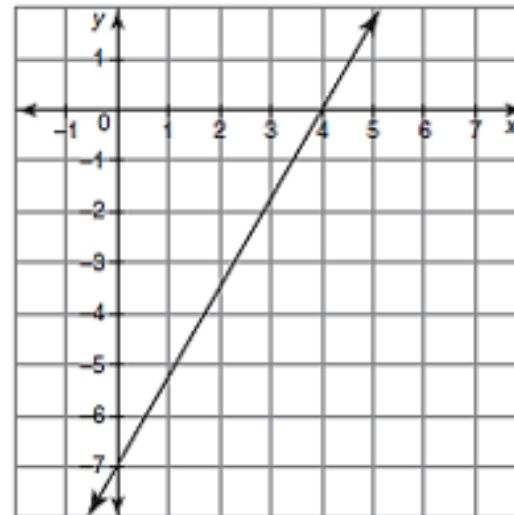
# EXTREMA

1.



Maximum: none  
Minimum: none

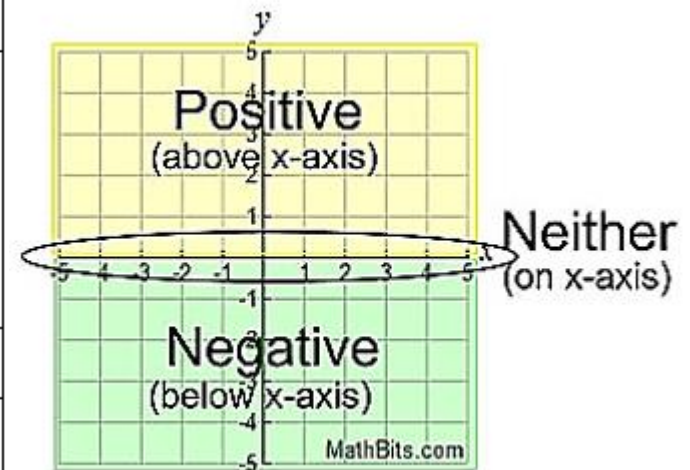
2.



Maximum: none  
Minimum: none

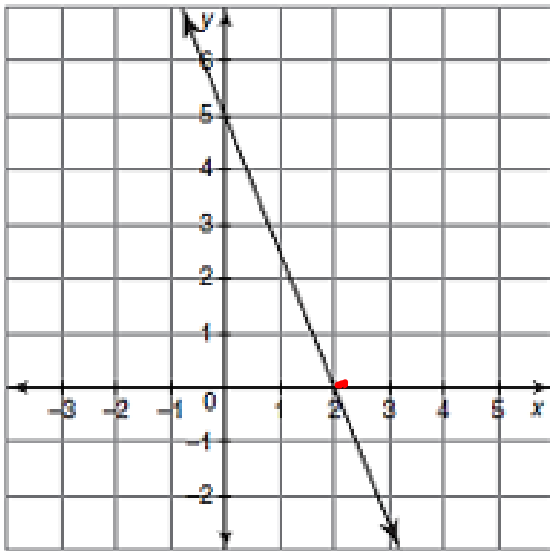
# POSITIVE & NEGATIVE PARTS OF THE GRAPH

Positive		
<i>Define:</i> The part of the function that is above the x-axis.	<i>Think:</i> Which part of the function is in the positive region and where?	<i>Write:</i> Inequality using zero value (x)
Negative		
<i>Define:</i> The part of the function that is below the x-axis.	<i>Think:</i> Which part of the function is in the negative region and where?	<i>Write:</i> Inequality using zero value (x)



# POSITIVE & NEGATIVE

1.



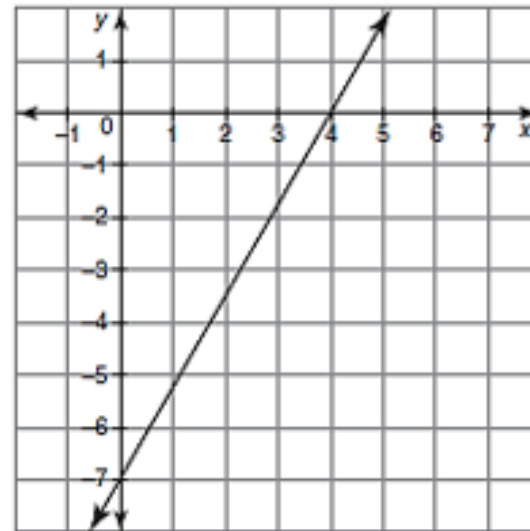
Positive: \_\_\_\_\_

$< 2$

Negative: \_\_\_\_\_

$> 2$

2.



Positive: \_\_\_\_\_

$< 4$

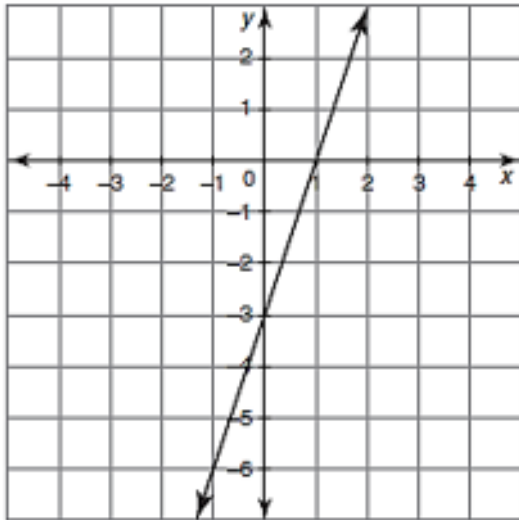
Negative: \_\_\_\_\_

$> 4$



# POSITIVE & NEGATIVE

3.



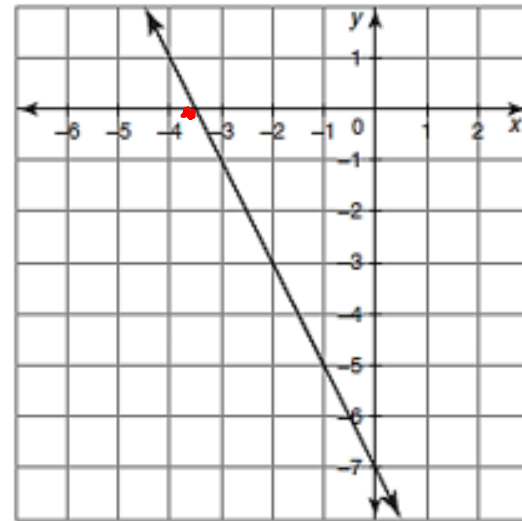
Positive: \_\_\_\_\_

$> 1$

Negative: \_\_\_\_\_

$< 1$

4.



Positive: \_\_\_\_\_

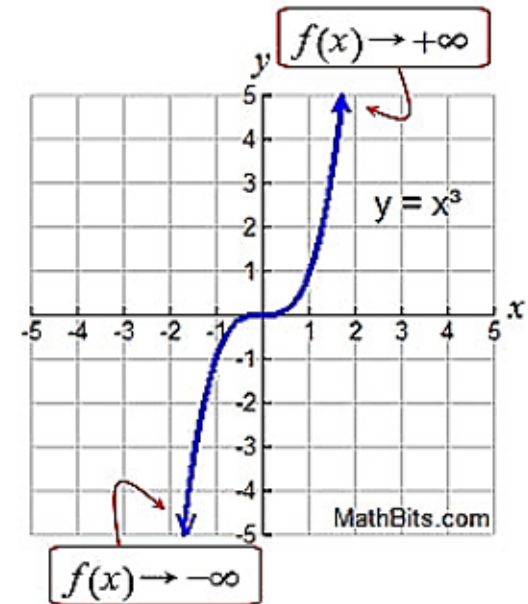
$< -3.5$

Negative: \_\_\_\_\_

$> -3.5$

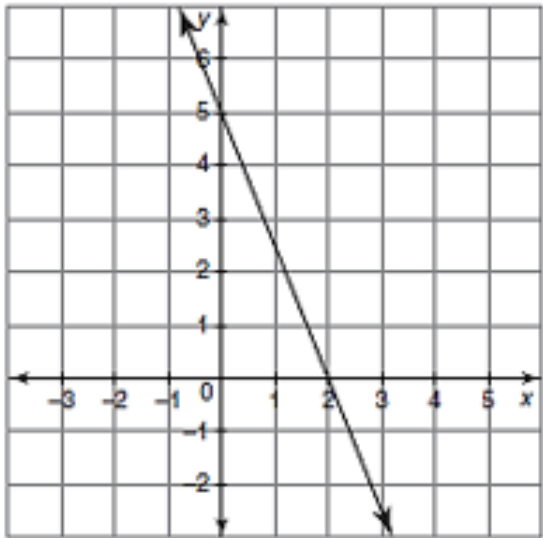
# END BEHAVIOR

End Behavior	
<i>Define:</i> Behavior of the ends of the function (what happens to the y-values or $f(x)$ ) as $x$ approaches positive or negative infinity. The arrows indicate the function goes on forever so we want to know where those ends go.	
<i>Think:</i> As $x$ goes to the left (negative infinity), what direction does the left arrow go?	<i>Write:</i> As $x \rightarrow -\infty$ , $f(x) \rightarrow$ _____
<i>Think:</i> As $x$ goes to the right (positive infinity), what direction does the right arrow go?	<i>Write:</i> As $x \rightarrow \infty$ , $f(x) \rightarrow$ _____



# END BEHAVIOR

1.



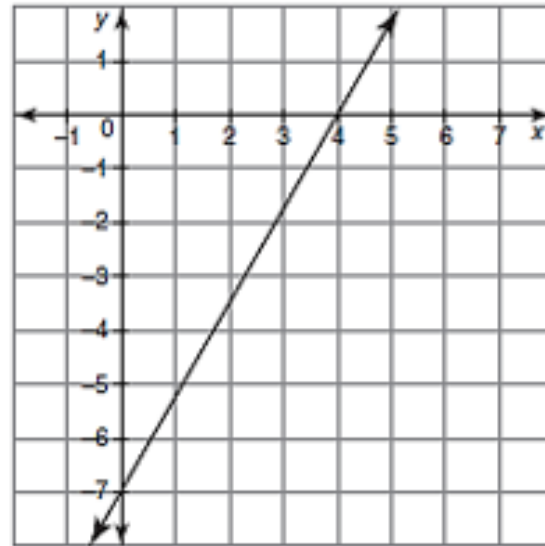
left

$$\text{As } x \rightarrow -\infty, f(x) \rightarrow \underline{\infty}$$

right

$$\text{As } x \rightarrow \infty, f(x) \rightarrow \underline{-\infty}$$

2.

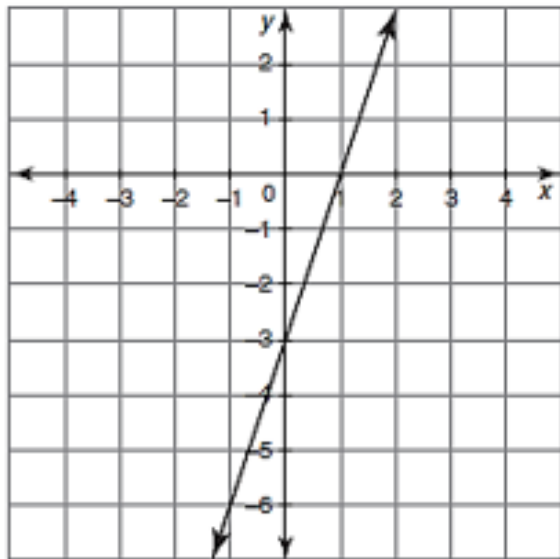


$$\text{As } x \rightarrow -\infty, f(x) \rightarrow \underline{-\infty}$$

$$\text{As } x \rightarrow \infty, f(x) \rightarrow \underline{\infty}$$

# END BEHAVIOR

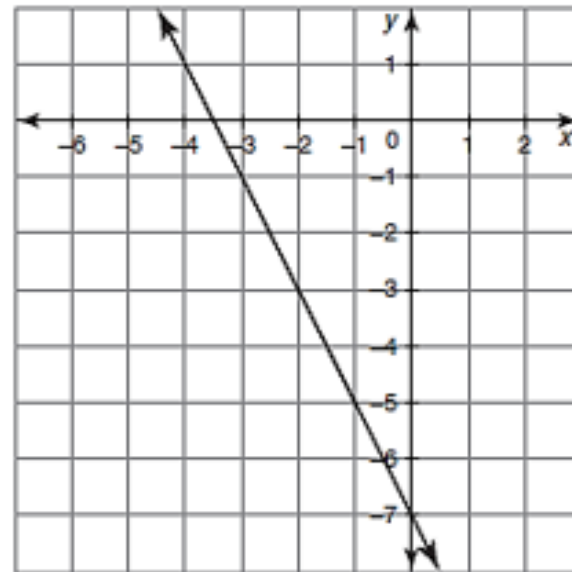
3.



As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \underline{-\infty}$

As  $x \rightarrow \infty$ ,  $f(x) \rightarrow \underline{\infty}$

4.

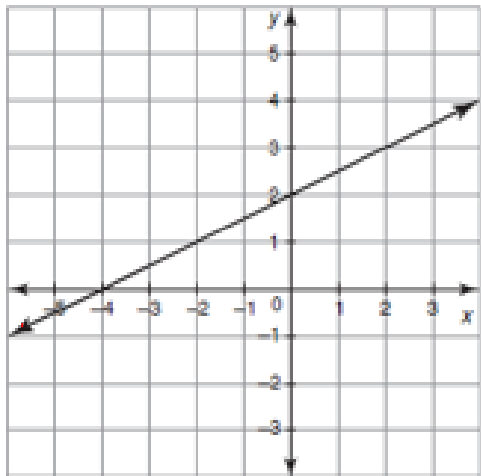


As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \underline{\infty}$

As  $x \rightarrow \infty$ ,  $f(x) \rightarrow \underline{-\infty}$

# EXAMPLE 1

Practice Example 1



Interval of Increase:  $-\infty < x < \infty$

Interval of Decrease: none

Interval of Constant: none

Maximum: none

Minimum: none

Positive:  $> -4$

Negative:  $< -4$

End Behavior:  
As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$

As  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$

Domain:  $(-\infty, \infty)$

Range:  $(-\infty, \infty)$

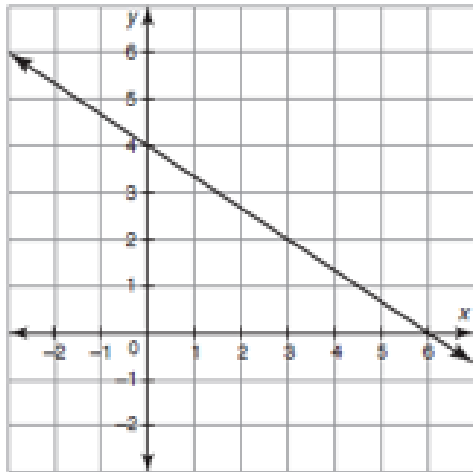
Y-intercept:  $(0, 2)$

X-intercept:  $(-4, 0)$

Zero:  $x = -4$

# EXAMPLE 2

Practice Example 2



Domain:  $(-\infty, \infty)$

Range:  $(-\infty, \infty)$

Y-intercept:  $(0, 4)$

X-intercept:  $(6, 0)$

Zero:  $x = 6$

Interval of Increase: none

Interval of Decrease:  $-\infty < x < \infty$

Interval of Constant: none

Maximum: none

Minimum: none

Positive:  $< 6$

Negative:  $> 6$

End Behavior:

As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \infty$

As  $x \rightarrow \infty$ ,  $f(x) \rightarrow -\infty$