

## Day 11 – Characteristics of Linear Functions

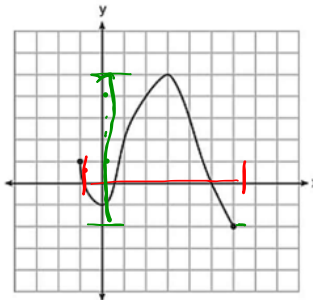
One key component to fully understanding linear functions is to be able to describe characteristics of the graph and its equation. **Important:** If a graph is a line (arrows), we need to assume that it goes on forever.

### Domain and Range

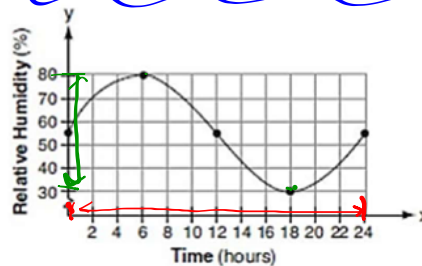
Domain		
<b>Define:</b> All possible values of x	<b>Think:</b> How far left to right does the graph go? 	<b>Write:</b> $\boxed{\text{Smallest } x \leq x \leq \text{Biggest } x}$ *use < if the circles are open*
Range		
<b>Define:</b> All possible values of y	<b>Think:</b> How far down to how far up does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

**Non Linear Examples:**

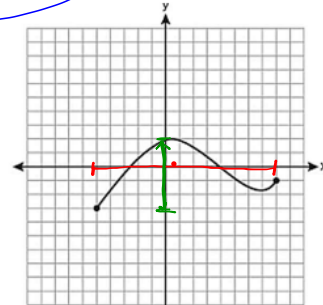
1.



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



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

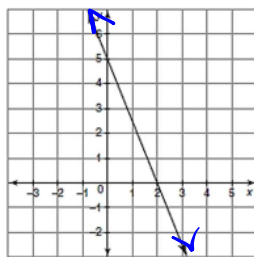


~~X~~ Domain:  $-5 \leq x \leq 8$   
 $[-5, 8]$   
 y Range:  $-3 \leq y \leq 2$   
 $[-3, 2]$

1.  $[\ ]$  if # included  
 2.  $( )$  if # not included

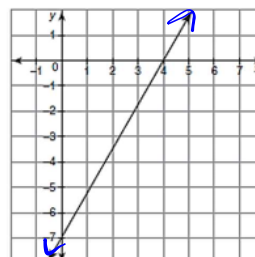
**Linear Examples:**

1.



~~X~~ Domain: all real #s  $\mathbb{R}$   
 y Range: all real #s  $\mathbb{R}$

2.



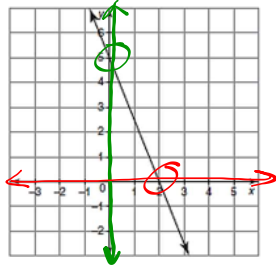
Domain:  $\mathbb{R}$   
 Range:  $\mathbb{R}$

**X and Y intercepts (including zeros)**

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

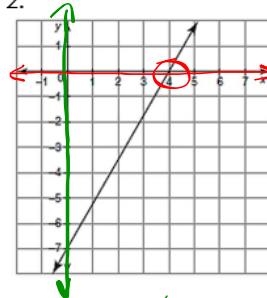
**Linear Examples:**

1.



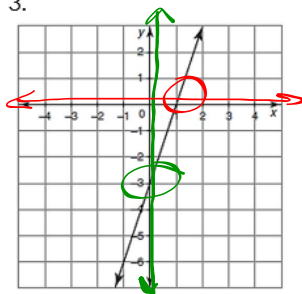
Y-intercept: (0, 5)  
X-intercept: (2, 0)  
Zero:  $x = 2$

2.



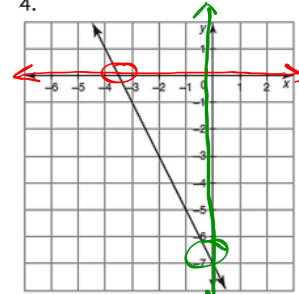
Y-intercept: (0, -7)  
X-intercept: (4, 0)  
Zero:  $x = 4$

3.



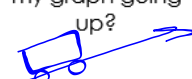
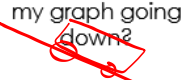

Y-intercept: (0, -3)  
X-intercept: (1, 0)  
Zero:  $x = 1$

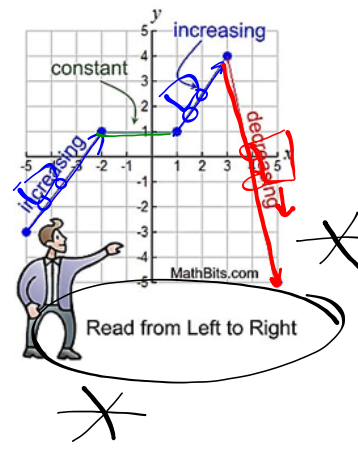
4.



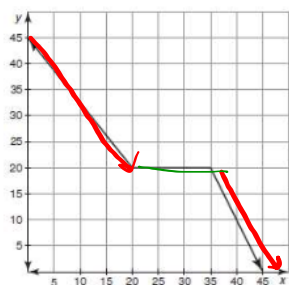
Y-intercept: (0, -7)  
X-intercept: (-3.5, 0)  
Zero:  $x = -3.5$

Interval of Increase and Decrease

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



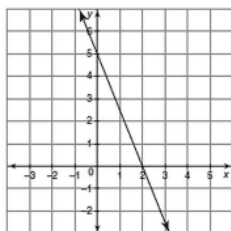
Non Linear Example:



Interval of Increase: none  
 Interval of Decrease:  $0 < x < 20, 35 < x < 45$   
 Interval of Constant:  $20 < x < 35$

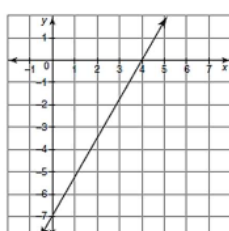
Linear Examples:

1.





Interval of Increase: none  
 Interval of Decrease: TR  
 Interval of Constant: none

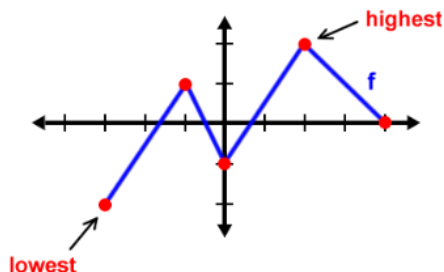
2.



Interval of Increase: TR  
 Interval of Decrease: none  
 Interval of Constant: none

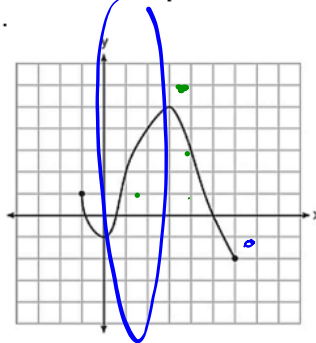
**Maximum and Minimum (Extrema)**

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



**Non Linear Examples:**

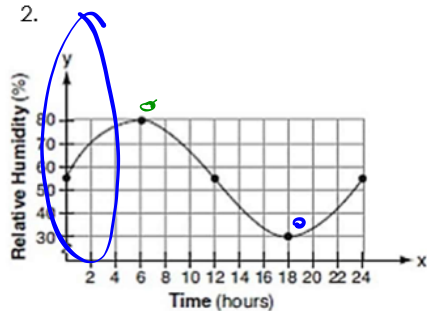
1.



Maximum:  
Minimum:

$(3, 5) \ y = 5$   
 $y = -2$

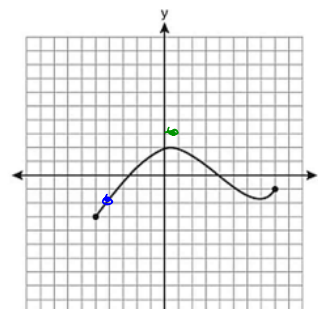
2.



Maximum:  
Minimum:

$y = 80$   
 $y = 30$

3.

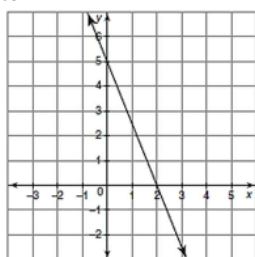


Maximum:  
Minimum:

$y = 2$   
 $y = -3$

**Linear Examples:**

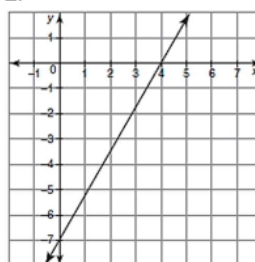
1.



Maximum:  
Minimum:

none  
none

2.



Maximum:  
Minimum:

none  
none

**\* NO CHANGE IN DIRECTION \***