Algebra 1 Unit 2 Linear Functions Notes

Day 5 – Characteristics of Linear Functions

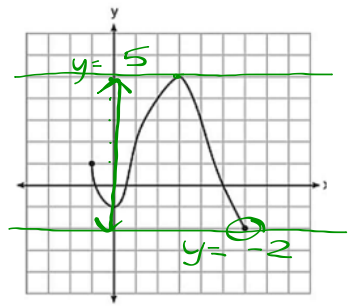
One key component to fully understanding linear functions is to be able to describe characteristics of the graph and its equation. **Important:** If a graph is a line (arrows), we need to assume that it goes on forever.

Domain and Range

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

Non Linear Examples:

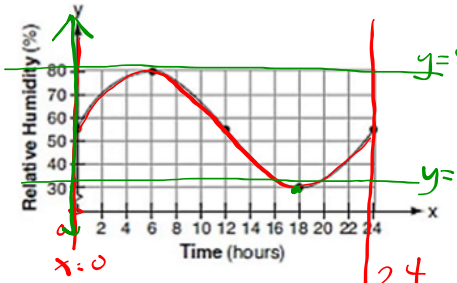
1.



Domain: $1 \le x \le 6$

Range: $-2 \le y \le 5$

2.

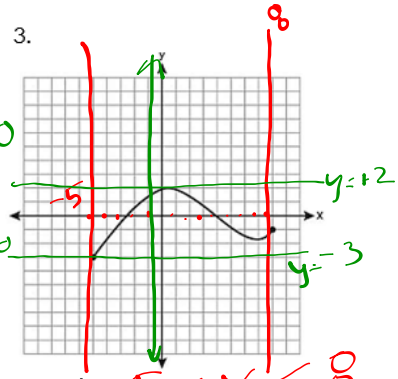


Domain: $0 \le x \le 24$

Range: $30 \le y \le 80$

$[30, 80]$

3.

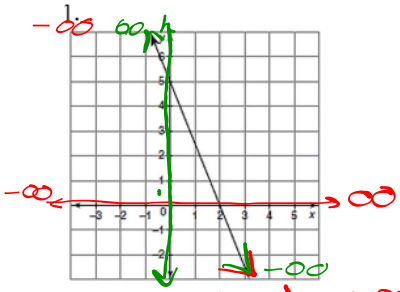


Domain: $-5 \le x \le 8$

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

Linear Examples:

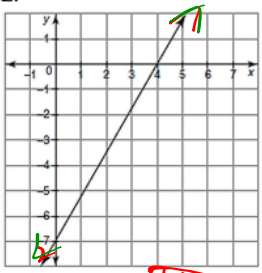
1.



Domain: $-\infty < x < \infty = \mathbb{R}$

Range: $-\infty < y < \infty$ $\mathbb{R}$

2.



Domain: $\mathbb{R}$

Range: $\mathbb{R}$

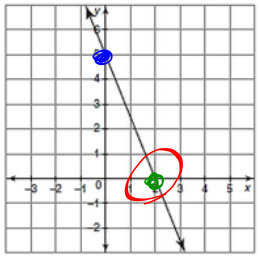
X and Y intercepts (including zeros)

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

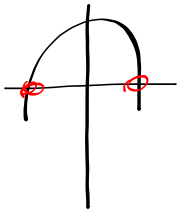
$y = mx + b$

Linear Examples:

1.

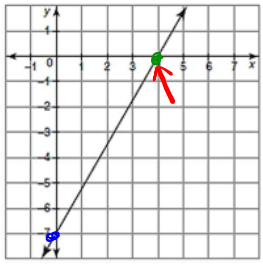


Y-intercept: (0,5)
X-intercept (2,0)
Zero: x=2



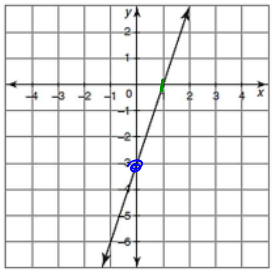
$y = mx + b$

2.



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

3.



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

$m = -2$

$y = -2x + -7$

$0 = -2x + -7$

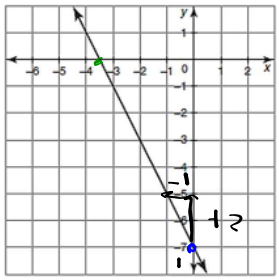
$+7 \quad +7$

$\frac{7}{-2} = \frac{-2x}{-2}$

$-7/2 = x$

$x = -3.5$

4.



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

Interval of Increase and Decrease

Interval of Increase

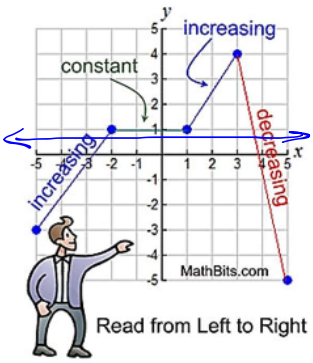
Define:	Think:	Write:
The part of the graph that is rising as you read left to right.	From left to right, is my graph going up?	x value where it starts increasing < x < x value where it stops increasing

Interval of Decrease

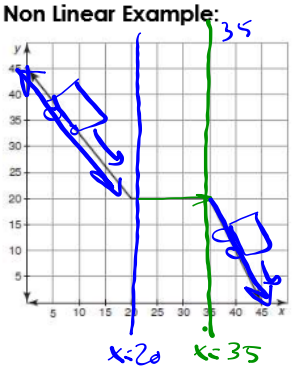
Define:	Think:	Write:
The part of the graph that is falling as you read from left to right.	From left to right, is my graph going down?	x value where it starts decreasing < x < x value where it stops decreasing

Interval of Constant

Define:	Think:	Write:
The part of the graph that is a horizontal line as you read from left to right.	From left to right, is my graph a flat line?	x value where it starts flat-lining < x < x value where it stops flat-lining



Non Linear Example:



Interval of Increase:

NONE

Interval of Decrease:

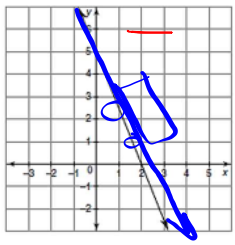
$-\infty < x < 20$; $35 < x < \infty$

Interval of Constant:

$20 < x < 35$

Linear Examples:

1.



Interval of Increase:

NO

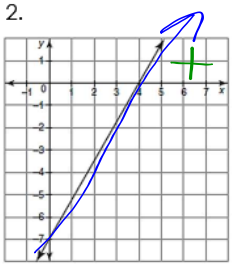
Interval of Decrease:

IR

Interval of Constant:

NO

2.



Interval of Increase:

IR

Interval of Decrease:

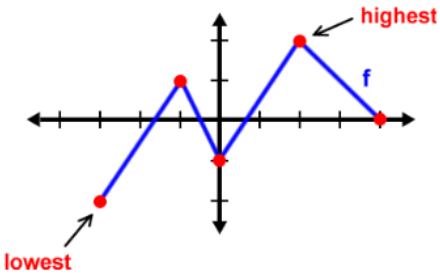
none

Interval of Constant:

none

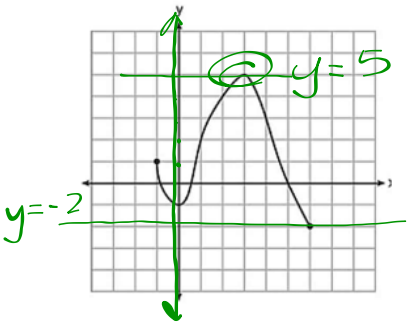
Maximum and Minimum (Extrema)

Maximum		
Define: Highest point or peak of a function.	**Think:** What is my highest point or value on my graph?	**Write:** If none, write none Otherwise, y = biggest y-value
Minimum		
Define: Lowest point or valley of a function.	**Think:** What is the lowest point or value on my graph?	**Write:** If none, write none Otherwise, y = smallest y-value



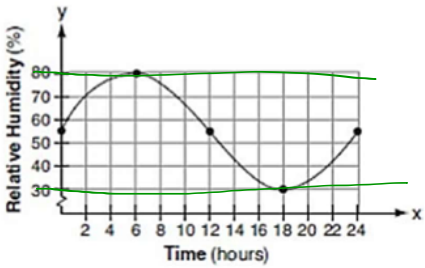
Non Linear Examples:

1.



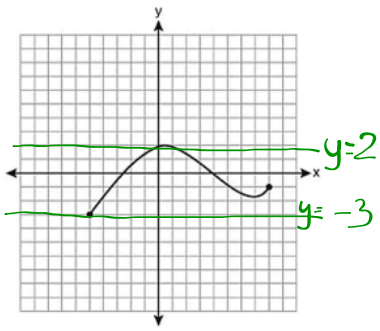
Maximum: y = 5
Minimum: y = -2

2.



Maximum: y = 80
Minimum: y = 30

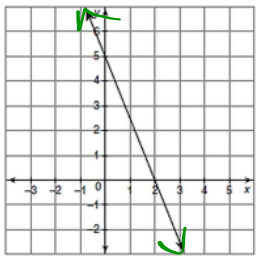
3.



Maximum: y = 2
Minimum: y = -3

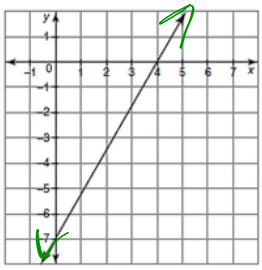
Linear Examples:

1.



Maximum: none
Minimum: none

2.



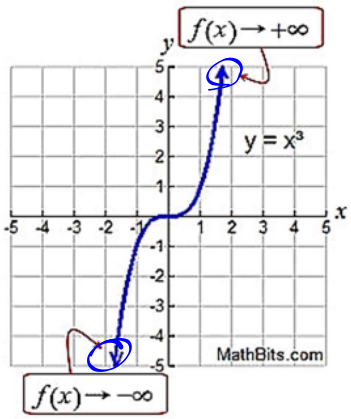
Maximum: none
Minimum: none

End Behavior

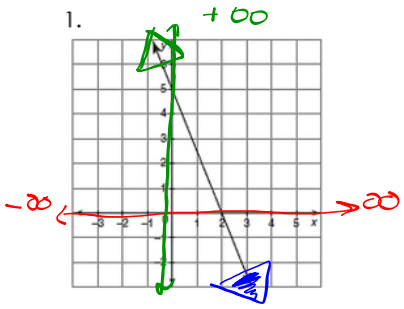
End Behavior

Define:
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.

Think:	**Write:**
As x goes to the left (negative infinity), what direction does the left arrow go?	As x → -∞, f(x) → _____
Think: As x goes to the right (positive infinity), what direction does the right arrow go?	**Write:** As x → ∞, f(x) → _____



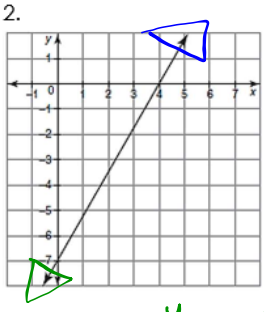
1.



As x → -∞, f(x) → _____

As x → ∞, f(x) → _____

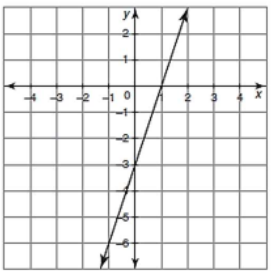
2.



As x → -∞, f(x) → _____

As x → ∞, f(x) → _____

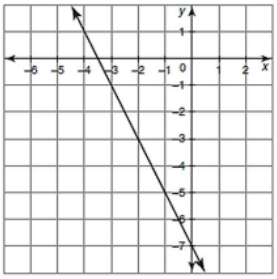
3.



As x → -∞, f(x) → _____

As x → ∞, f(x) → _____

4.



As x → -∞, f(x) → _____

As x → ∞, f(x) → _____