2.1

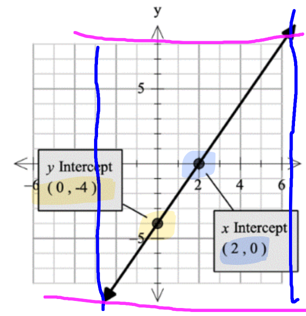
Date: 9/20/21

Objective: I can identify and explain in context key features of a graph.

Domain, Range, and Intercepts

Domain: the set of all x-values of a function – left to right

Range: the set of all y-values of a function – bottom to top



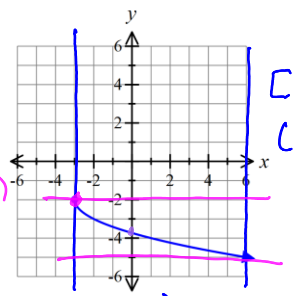
D = (-∞, ∞)

R = (-∞, ∞)

X-Intercepts: where the function crosses the x-axis. Written $(x, 0)$

Y-Intercepts: where the function crosses the y-axis. Written $(0, y)$

Practice: For each graph below, identify the domain, range, x-intercept, and y-intercepts



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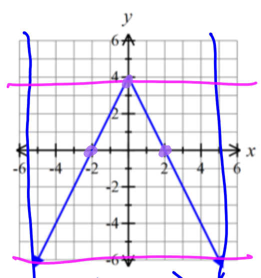
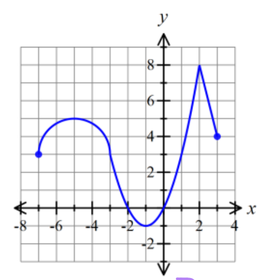




Domain: [-3, ∞)

Range: (-∞, -2]

(x, y)

x-intercepts: none

y-intercepts: (0, -3.5)

Domain: (-∞, ∞)

Range: (-∞, 4]

x-intercepts: (2, 0) (-2, 0)

y-intercepts: (0, 4)

Domain: [-7, 3]

Range: [-1, 8]

x-intercepts: (-2, 0) (0, 0)

y-intercepts: (0, 0)

You can also find the domain of a function without looking at the graph. When looking at an equation, the domain is always $(-\infty, \infty)$ unless there is a restriction.

There are 3 types of restrictions. We are only doing one of them today.

RESTRICTION #1: When you take an even root, the radicand CANNOT be negative. $\sqrt{-4}$ $\sqrt[4]{-16}$

To find the restriction of $y = \sqrt{x-1} + 3$ – not neg

1. Set what is under the square root ≥ 0	$x - 1 \geq 0$
2. Solve the inequality (remember that if you divide by a negative number you have to switch direction of the inequality)	$x \geq 1$
3. Write in interval notation.	$[1, \infty)$

Practice: Find the domain of each function algebraically.

a. $f(x) = \sqrt{2x - 6}$

$2x - 6 \geq 0$

$2x \geq 6$

$x \geq 3$

$[3, \infty)$

b. $f(x) = (x + 2)\sqrt{-x + 4}$

$-x + 4 \geq 0$

$-x \geq -4$ if ÷ by neg flip symbol

$x \leq 4$

$(-\infty, 4]$

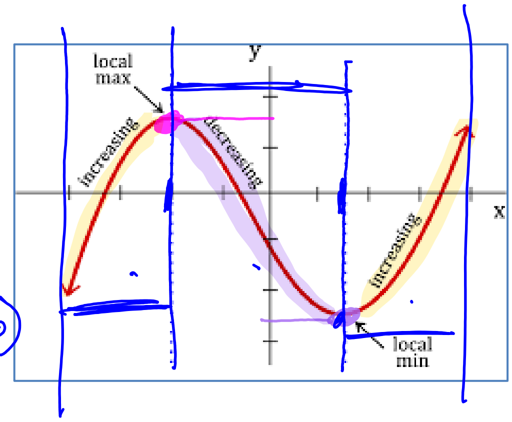
c. $f(x) = 5x^2 + 2x - 8$

$(-\infty, \infty)$

<u>Increasing/Decreasing & Maximum/Minimum Points</u>

Maximum Point: A point that is higher than all the points around it

Minimum Point: a point that is lower than all the points around it.



Increasing Interval: as you look from left to right, the graph is going up

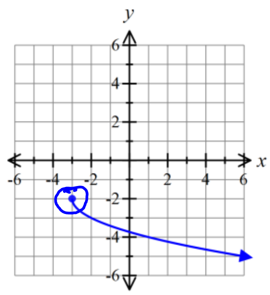
Decreasing Interval*:* as you look from left to right, the graph is going down

Example: Look at the graph on the right and identify the key features.

y= Local Maximum: 1.5 x= Increasing Intervals: $(-\infty,-2)\cup(1.5,\infty)$

y= Local Minimum: -2.5 x= Decreasing Intervals: $(-2, 1.5)$

Practice: ☆ always use ( ) on inc/dec

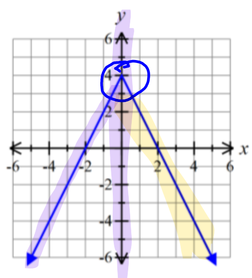


Local Max: -2 or (-3,-2)

Local Min: none

Increasing Intervals: N/A

Decreasing Intervals: $(-3,\infty)$

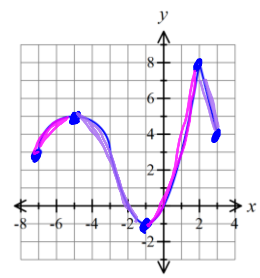


Local Max: 4

Local Min: N/A

Increasing Intervals: $(-\infty,0)$

Decreasing Intervals: $(0,\infty)$



Local Max: 5, 8

Local Min: -1, 3, 4

Increasing Intervals: $(-7,-5)\cup(-1,2)$

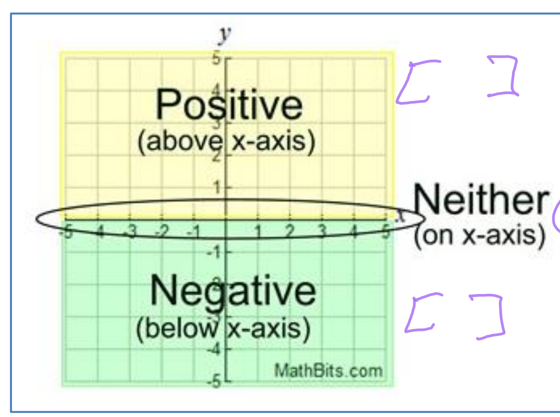
Decreasing Intervals: $(-5,-1)\cup(2,3)$

<u>Positive/Negative Intervals</u>

Positive Intervals: the graph is above the x-axis

Negative Intervals: the graph is below the x-axis

Neither: the graph is on the x-axis



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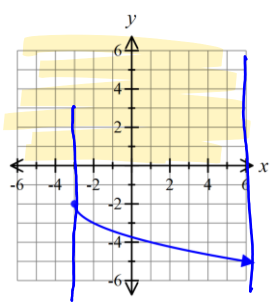
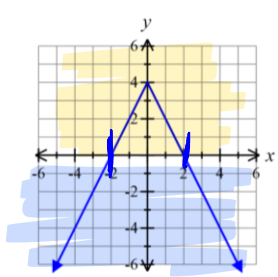
Practice: Identify the positive and negative intervals of each graph.



Positive Intervals: N/A

Negative Intervals: $[-3,\infty)$



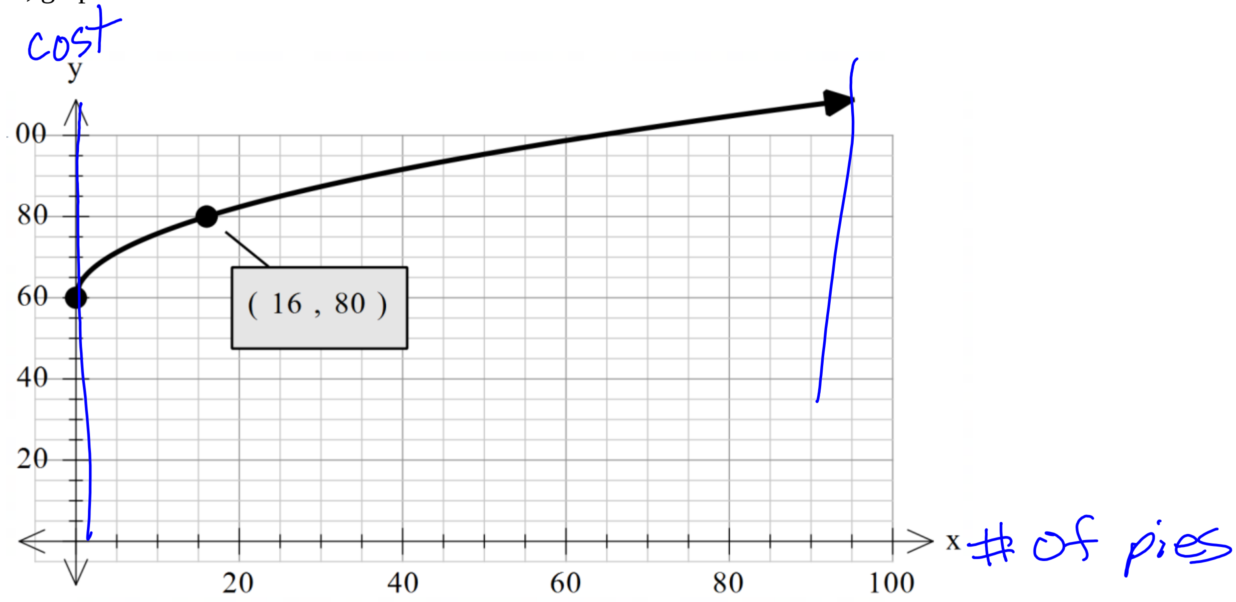
Positive Intervals: $(-2,2)$

Negative Intervals: $(-\infty,-2)\cup(2,\infty)$

Real World Graphs

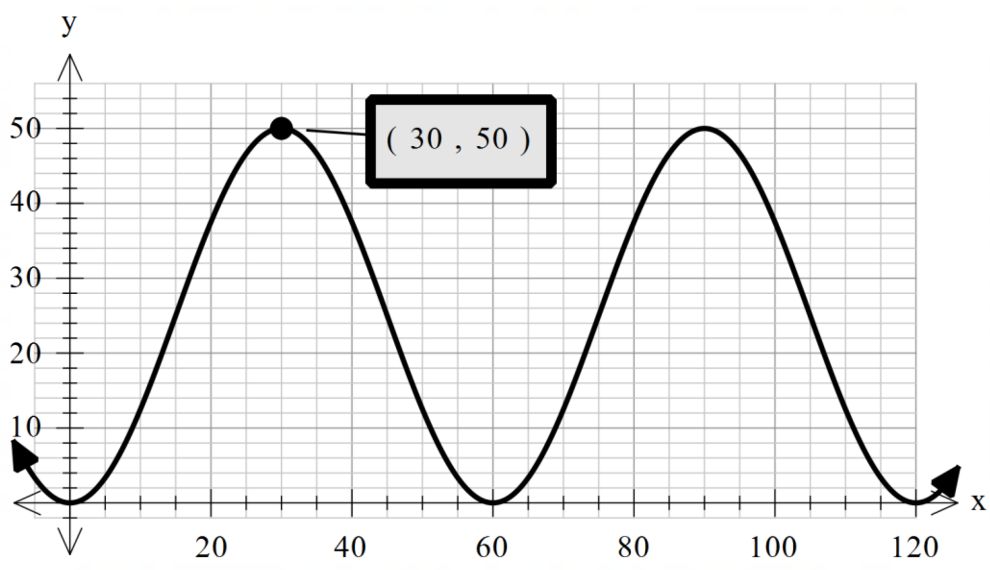
For each graph, identify the key features. Then decide what each key feature means in the context. If the key feature does not apply to the graph write NA and explain why it does not apply to the context.

1. Suppose we start a class business selling pies on Pi Day (March 14). The cost to make our pies is given by the function $C(x) = 5\sqrt{x} + 60$, graphed below.



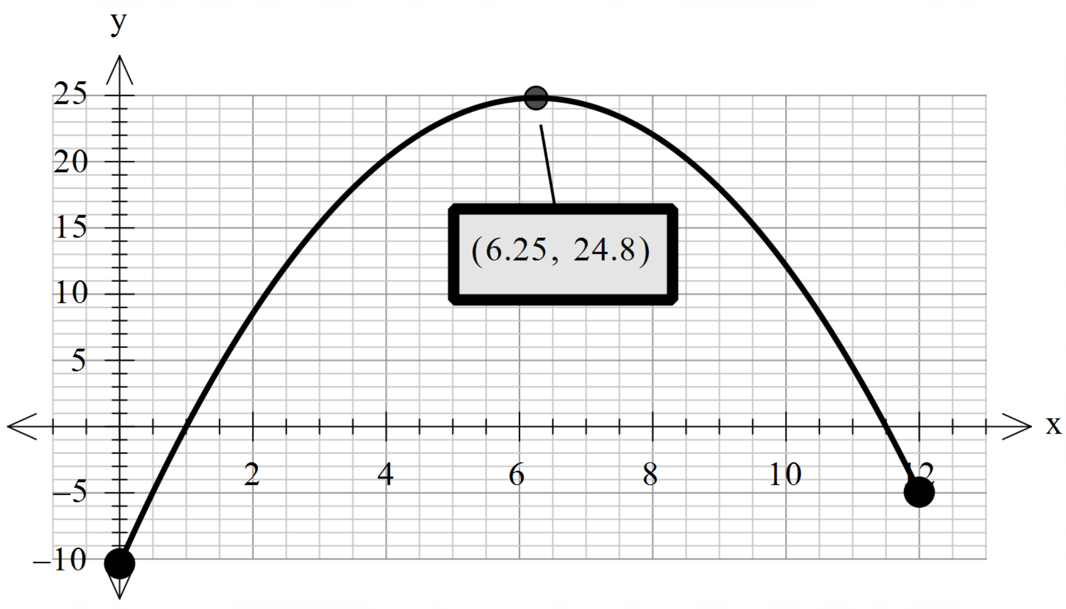
Key Feature	What does it mean in the context?
Domain [0, ∞)	I can make 0 pies or more.
Range [60, ∞)	It costs min $60 to make pie and get higher.
x-intercept(s): None	When you make 0 pies it will not cost $0.
y-intercept: (0, 60)	To make 0 pies it costs $60.
Increasing Interval(s): (0, ∞)	That means the more pies you make the more money it costs.
Decreasing Intervals(s): N/A	It will never go down in cost when you make pies.
Local Max: N/A	There is no end to the number of pies you can make or how much money it costs.
Local Min: (0, 60)	The min amount of pies you can make is 0. and min amount of cost.
Positive Interval(s): [0, ∞)	The more pies you make, it will always cost money.
Negative Interval(s): None	The number of pies you make will never be negative cost.

2. Suppose we take a class trip to Lagoon and ride the Ferris Wheel. Our height on the Ferris Wheel based on the number of seconds we have been on the ride is given by the function $h(x) = -25\cos\left(\frac{\pi}{30}x\right) + 25$



Key Feature	**What does it mean in the context?**
Domain	
Range	
x-intercept(s):	
y-intercept:	
Increasing Interval(s):	
Decreasing Intervals(s):	
Local Max:	
Local Min:	
Positive Interval(s):	
Negative Interval(s):	

3. The average temperature on a given day in Utah is represented in the graph below. The x-axis is measured in months and the y-axis in degrees Celsius.



Key Feature	What does it mean in the context?
Domain	
Range	
x-intercept(s):	
y-intercept:	
Increasing Interval(s):	
Decreasing Intervals(s):	
Local Max:	
Local Min:	
Positive Interval(s):	
Negative Interval(s):	