Warm - Up

Saturday, January 24, 2015

1. Simplify the expression $(6y^3)^2y^2$

2. Simplify the expression $\frac{17x^3y^9}{17x^2y^{11}}$

3. Simplify the expression $\sqrt{75}$

4. Simplify the expression $\sqrt{128}$

Functions

Objectives

Give the graph of a function, define and identify the following characteristics of that function.

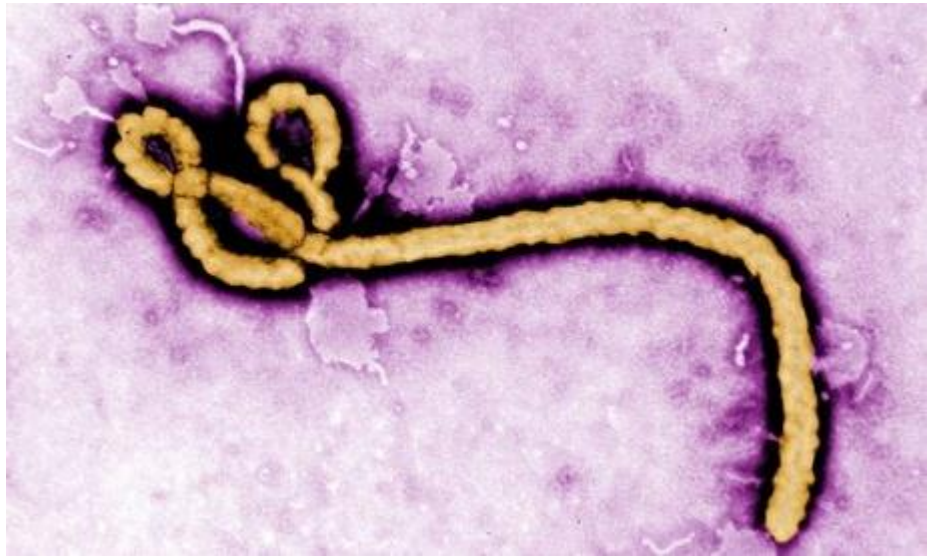
- Domain/Range
- Maximum /Minimums
- Increasing/Decreasing Intervals
- Vertexes
- Intercepts, x and y

Homework

Finish the Domain and Range worksheet we start in class today.
Problems P1 and P2 on the unit study guide,

What's the big deal?

Any idea what this is?



The Ebola virus has been in the news for a while now.

The CDC will use functions to predict the spread rate of this deadly virus.

Why is that useful?

Functions

Fabric	Sewing Machine	Jeans
Elapsed Time	Population Model	Predicted Cases of Ebola
x	$f(x)$	y

Functions

x $f(x)$ y

Where is the dependent variable?

Where is the independent variable?

A trip down memory lane…

A ***FUNCTION*** is a relation in which each **input value** corresponds with exactly one **output value**.

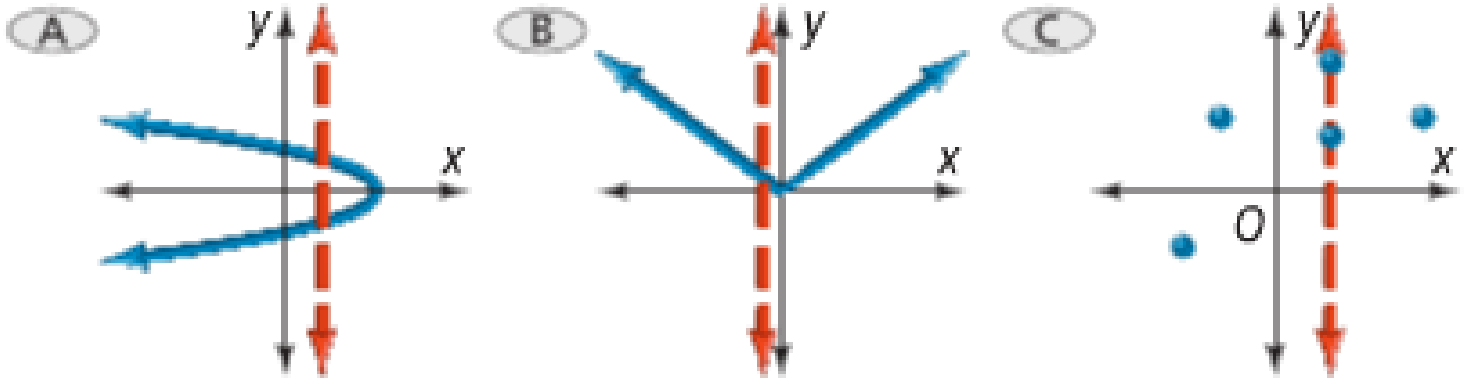
Another way to say this…

A ***FUNCTION*** is a relation in which each **x value** corresponds with exactly one **y value**.

Yet another way to say this…

A ***FUNCTION*** is a relation in which each element of the **domain** corresponds with exactly one element of the **range**.

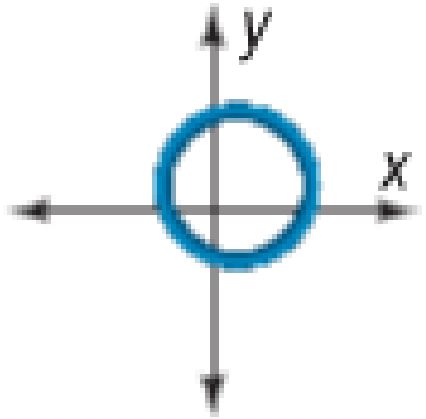
We have a tool that lets us look at a graph to determine if a function is being represented.



The Vertical Line Test is one way to determine whether a relation is a function. If any vertical line intersects the graph of a relation in more than one point, the relation is not a function.

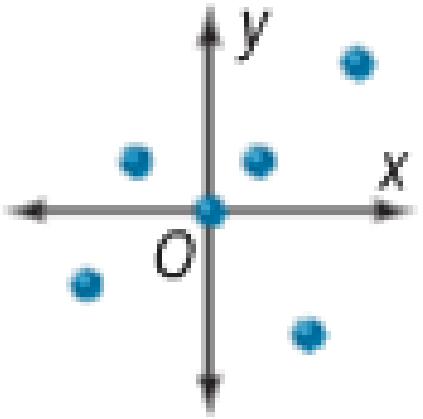
Which of the following graphs represent a function?

a.



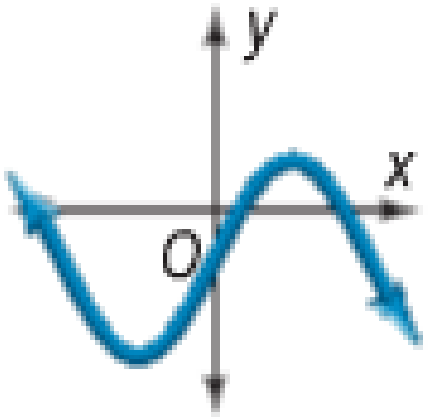
X

b.



YES

c.



YES

Functions

Evaluate each function for the given value of **x**, and write the input and output f(x) as an ordered pair.

$f(x) = -9x - 2$ for $x = 7$

$f(7) = -9(7) - 2 = -65$

Ordered pair: (7,-65)

$f(x) = -\frac{12x}{5}$ for $x = -1$

$f(-1) = \frac{12}{5}$

Ordered pair: $(-1,\frac{12}{5})$

Functions

Evaluate each function for the given value of **x**, and write the input and output f(x) as an ordered pair.

$f(x) = -\frac{2x + 1}{3}$ for $x = -5$

$f(x) = \frac{2}{9}x - \frac{9}{2}$ for $x = 9$

Functions

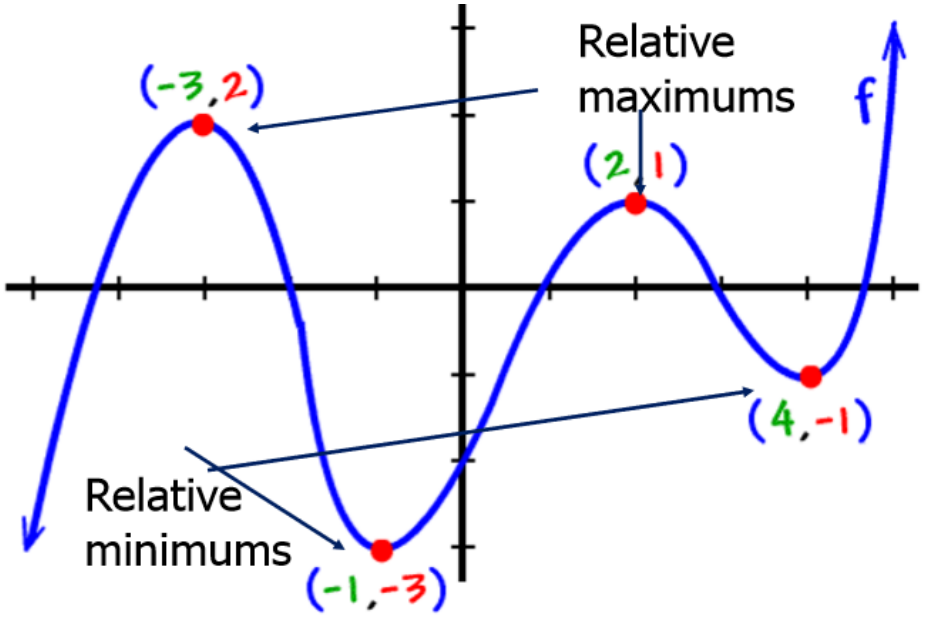
Maximums and Minimums

In Math Speak

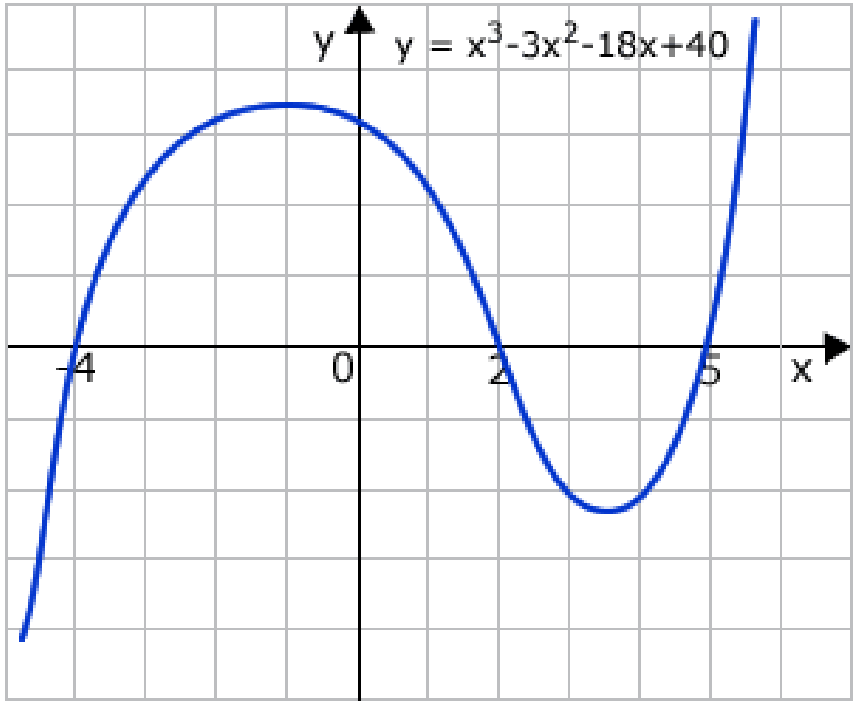
A **maximum** is the highest point on the peak of a graph (peak).

A **minimum** is the lowest point on the valley of a graph (valley).

Maximum and Minimums are **points** so they are represented by a coordinate point, **(x,y).**



For the following function, identify any minimum(s) or maximum(s).



Maximum(s):

One maximum point at (-1,3.5)

Minimum(s):

One minimum point at (3.5, -2.25)

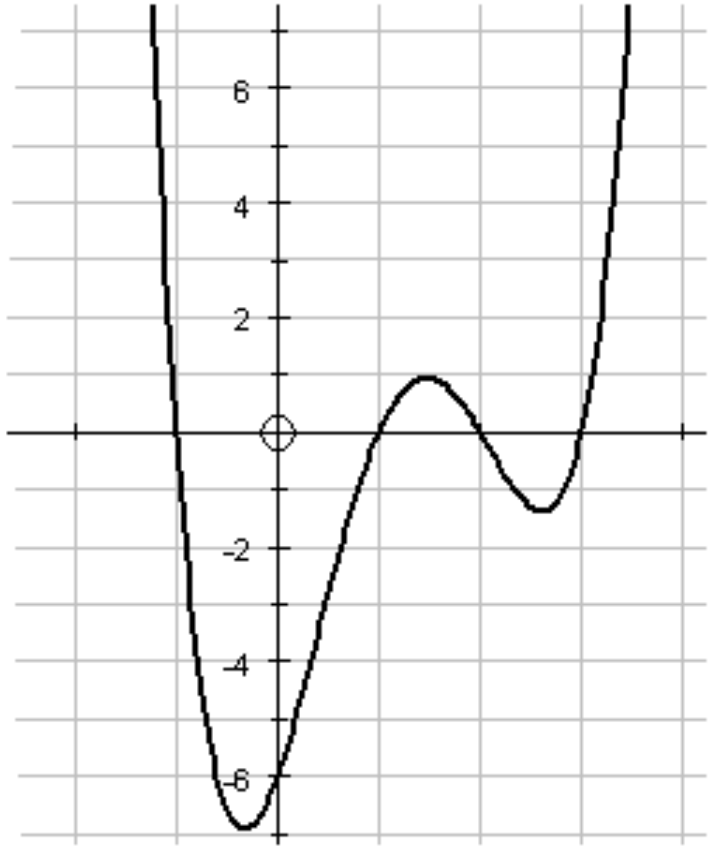
For the following function, identify any minimum(s) or maximum(s).

Maximum(s):

One maximum point at (3,1)

Minimum(s):

Two minimum points, (-1,-7) and (5,-1.25)



Increasing, and Decreasing Intervals

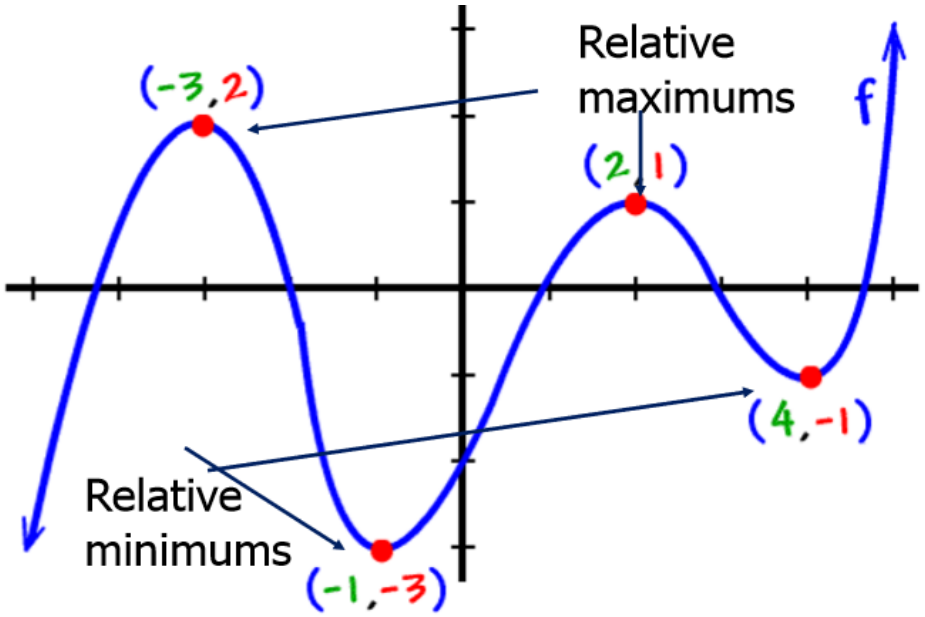
In Math Speak

A function *f* is **increasing** on an interval if **as x increases then f(x) increases**

A function *f* is **decreasing** on an interval if **as x increases then f(x) decreases**

When we write an interval, we put it in terms of the **x values** for which the interval is defined.

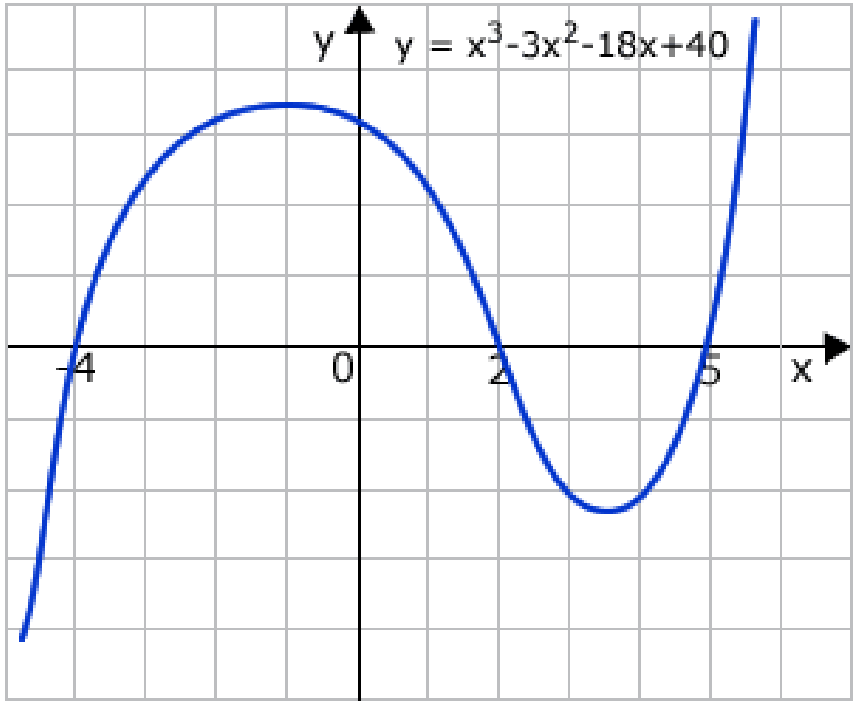
Always use the **round** brackets!



Another word about Maximums and Minimums

The peaks and valleys are where a function **changes** from increasing to decreasing or vice versa.

For the following function, identify any increasing and decreasing intervals.



Increasing interval(s)

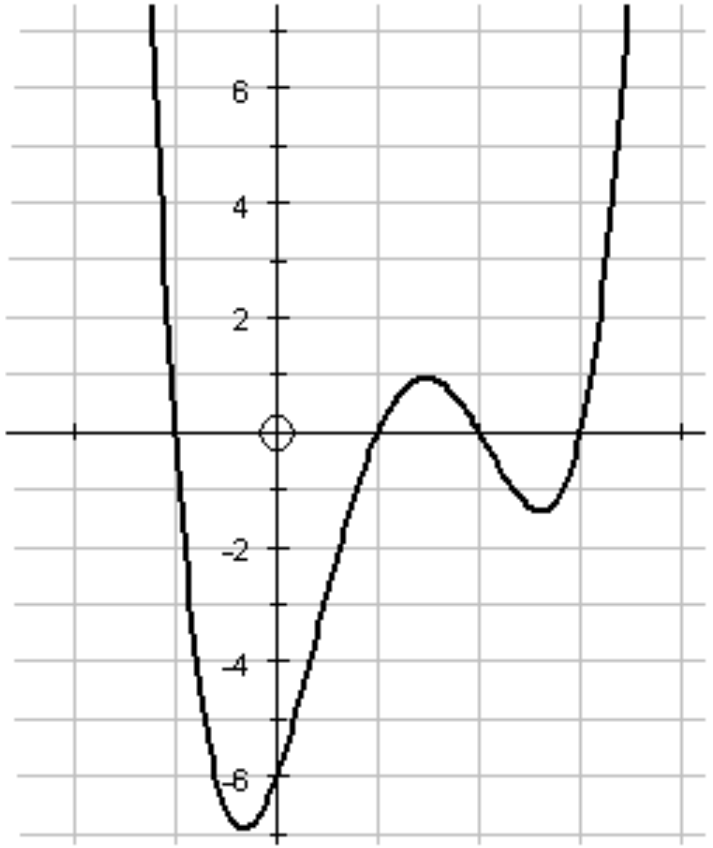
Two intervals, $(-\infty, -1)$ and $(3.5, \infty)$

Decreasing interval(s):

One interval, $(-1, 3.5)$

Functions

For the following function, identify any increasing and decreasing intervals.



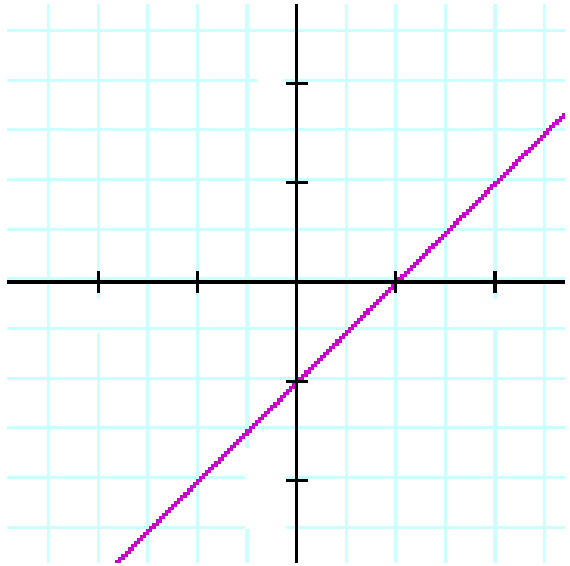
Increasing interval(s)

Two intervals, $(-1, 3) and\ (5, \infty)$

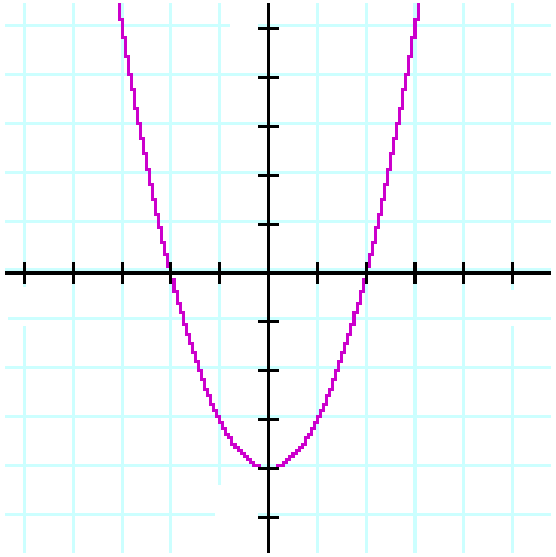
Decreasing interval(s):

Two intervals, $(-\infty, 1) and\ (3, 5)$

For each function below find the intervals on which the function is increasing, and decreasing.



Increasing: $(-\infty,\infty)$
Decreasing: n/a

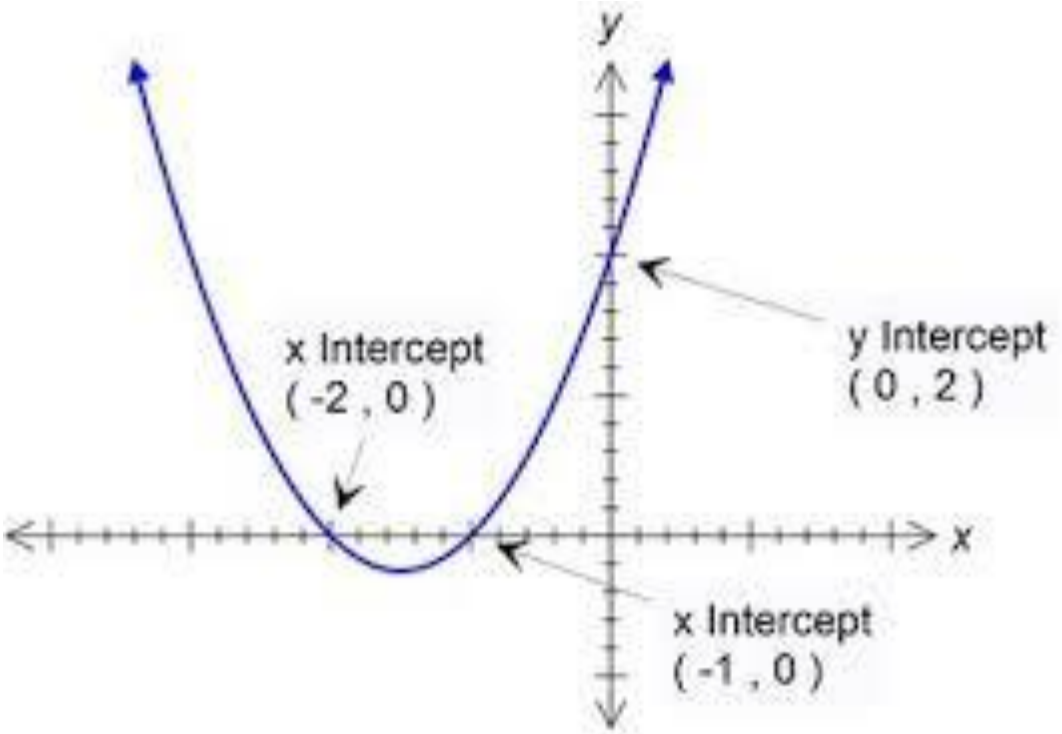


Increasing: $(0, \infty)$
Decreasing: $(-\infty, 0)$

Intercepts

X Intercept: where a function crosses the x axis and y=0.

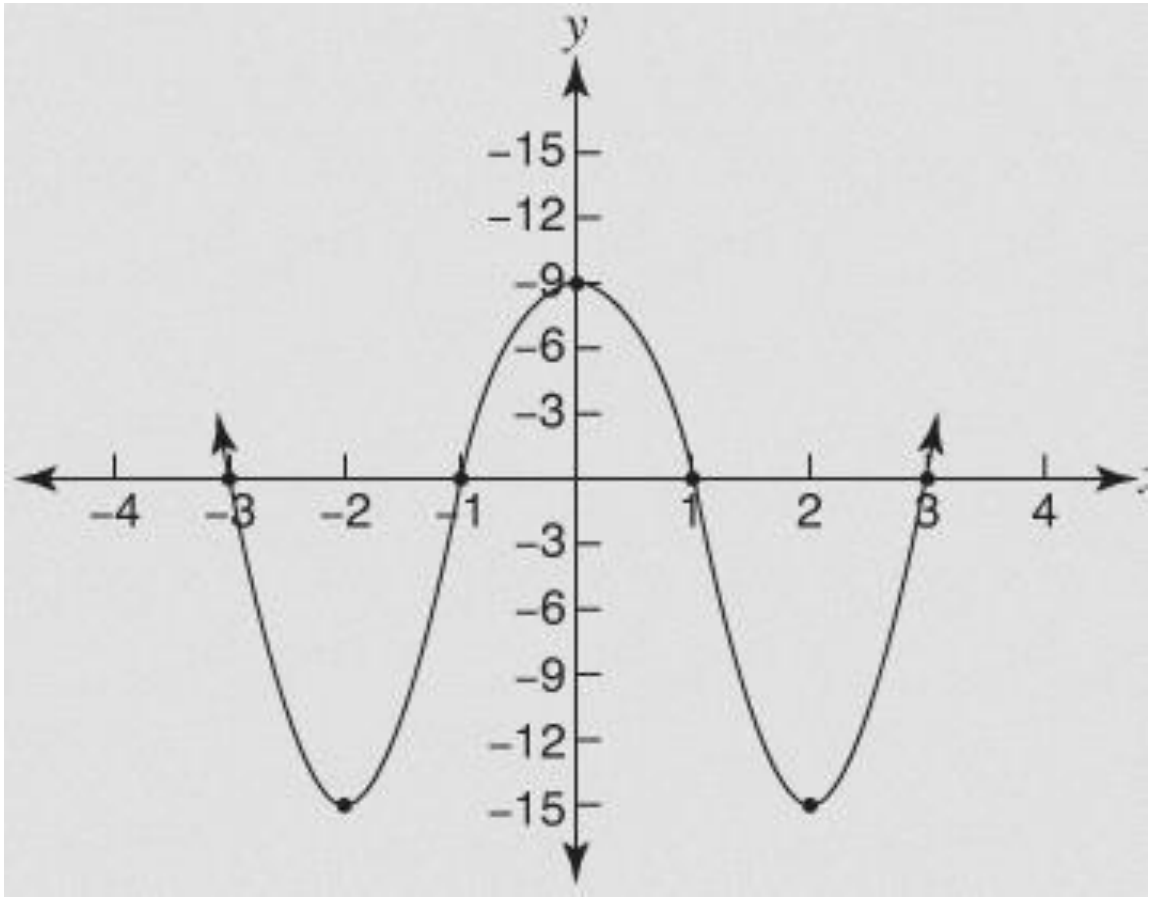
Y Intercept: where a function crosses the y axis and x=0.



Functions

Practice

Identify the following	
Maximum(s)	
Minimum(s)	
Increasing Intervals	
Decreasing Intervals	
x Intercepts	
y intercepts	



Functions

Practice

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Maximum(s)	
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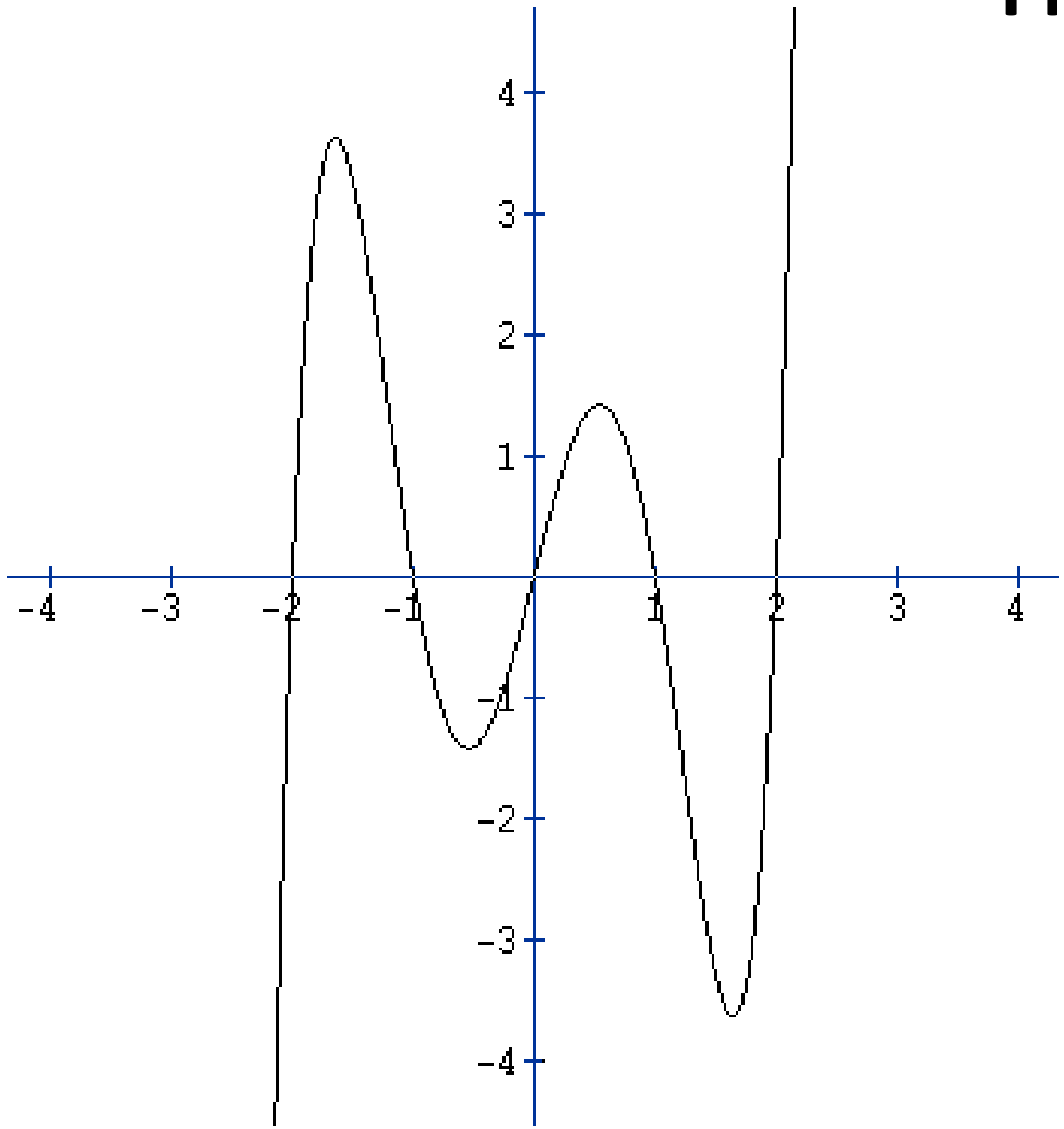


Domain and Range

Domain	Range
Input	Output
x	y

Domain and **Range** are intervals.

Domain is the interval(s) of **X values** for which there is a corresponding Y value.

Range is the interval(s) of **Y values** for which the there is a corresponding X value.

Functions

Look at the x axis.

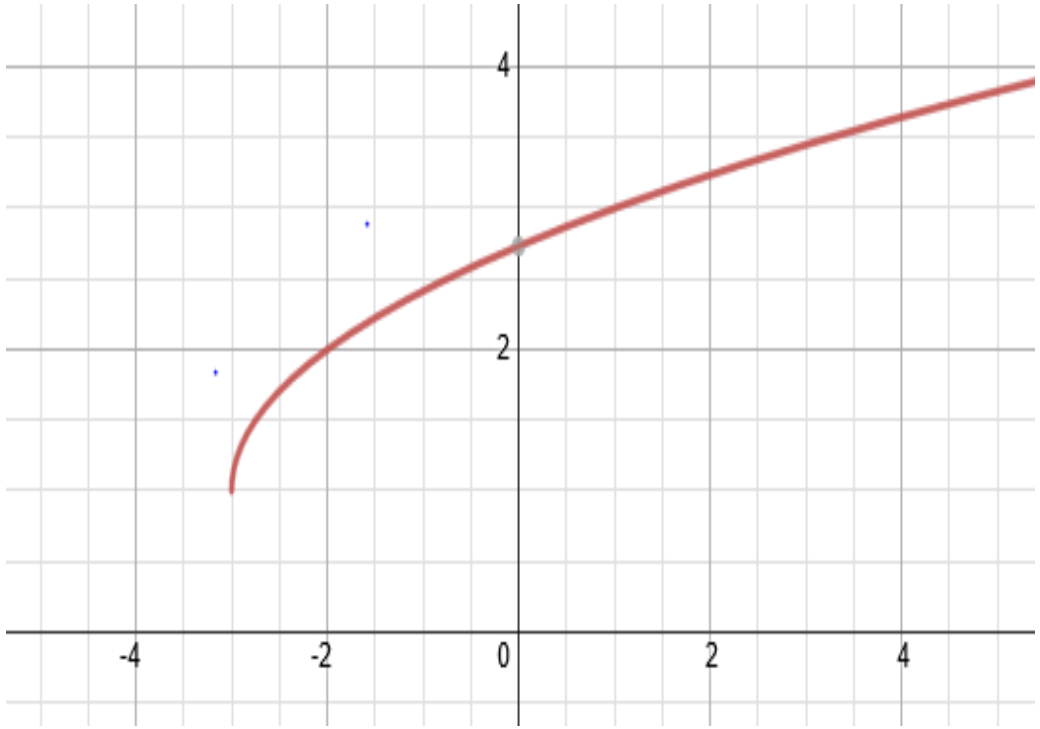
Lets look at Domain first

Remember if there is no dot at the far ends of the graph then it goes on forever in that direction.

Work from left to right. (or smallest numbers to largest numbers)

Where is the first x value that has a corresponding y value?

-3



Functions

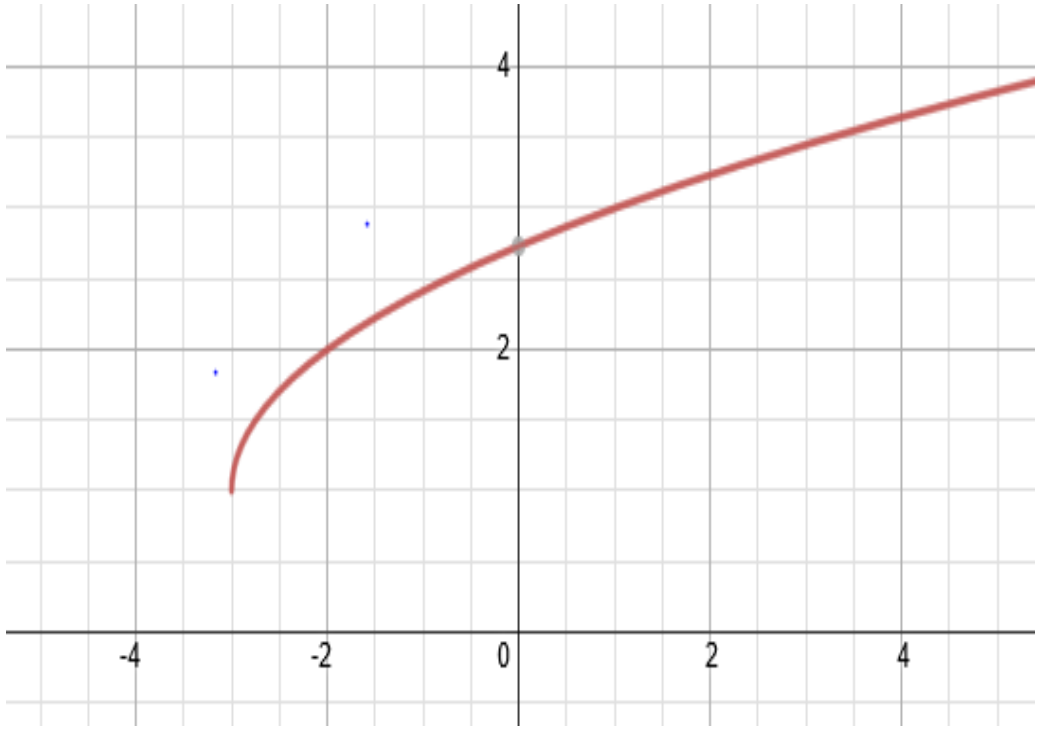
Look at the x axis.

Lets look at Domain first

Continue tracing from left to right. (or smallest numbers to largest numbers)

Where is the last x value that has a corresponding y value?

Since we don't have one, the function goes on forever off to the right. We say the domain interval "ends" at ∞.



So the domain for this function is $(-3, \infty)$

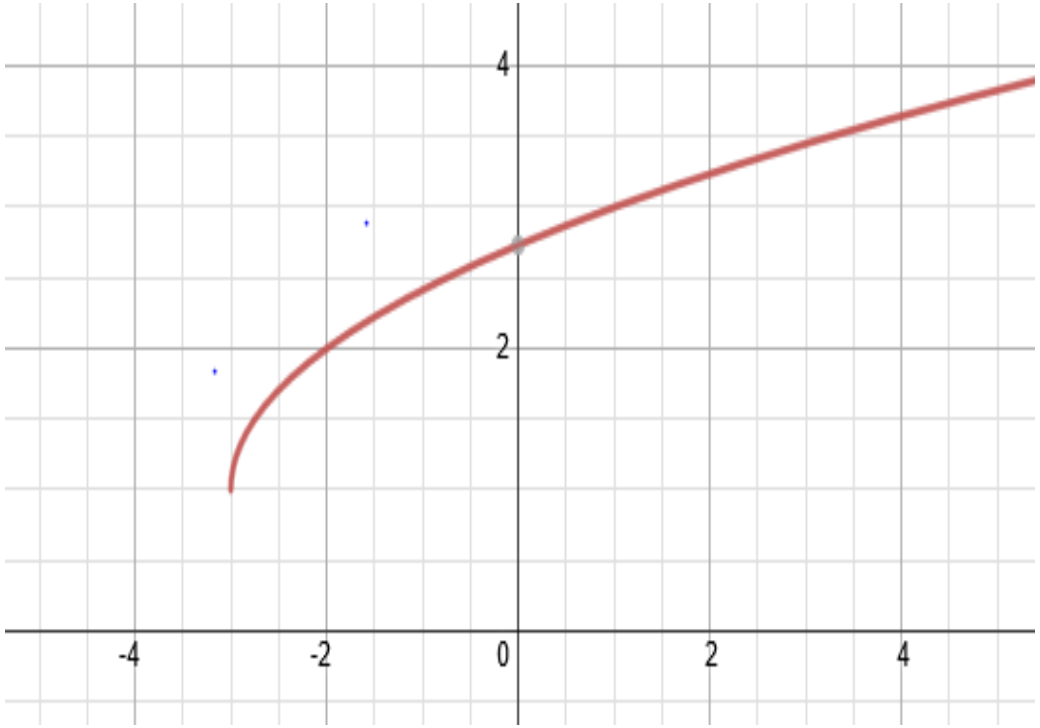
Functions

Range

Look at the y axis.

Work from bottom to top. (or smallest numbers to largest numbers)

Where is the first y value that has a corresponding x value? 1



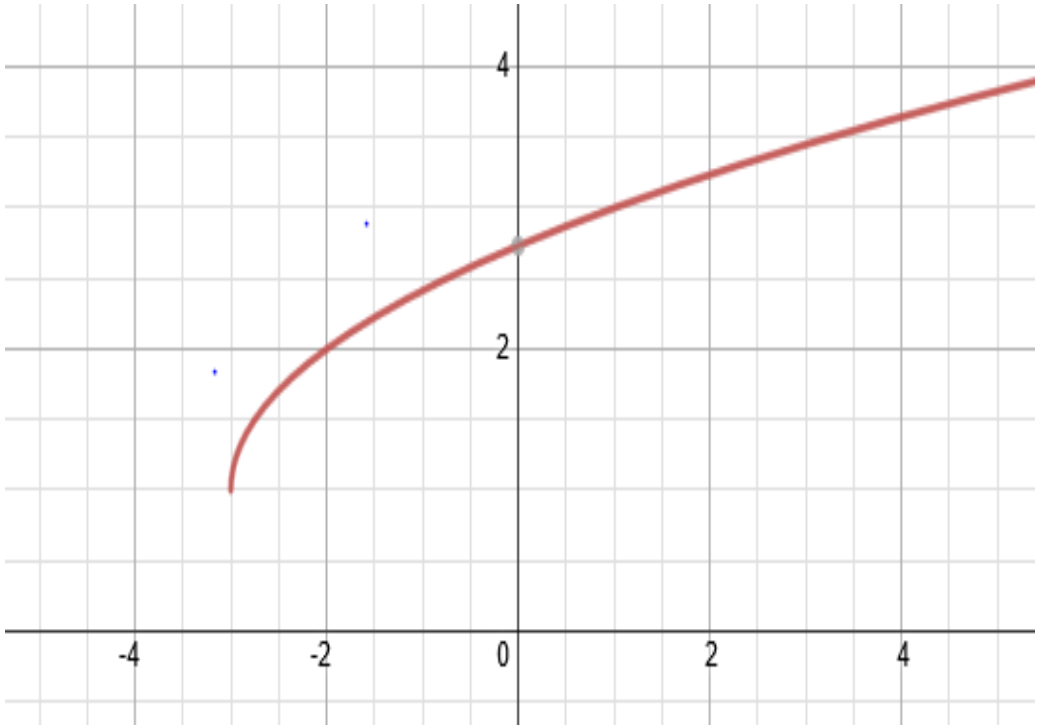
Range

Look at the y axis.

Continue tracing from bottom to top.

Where is the last y value that has a corresponding x value?

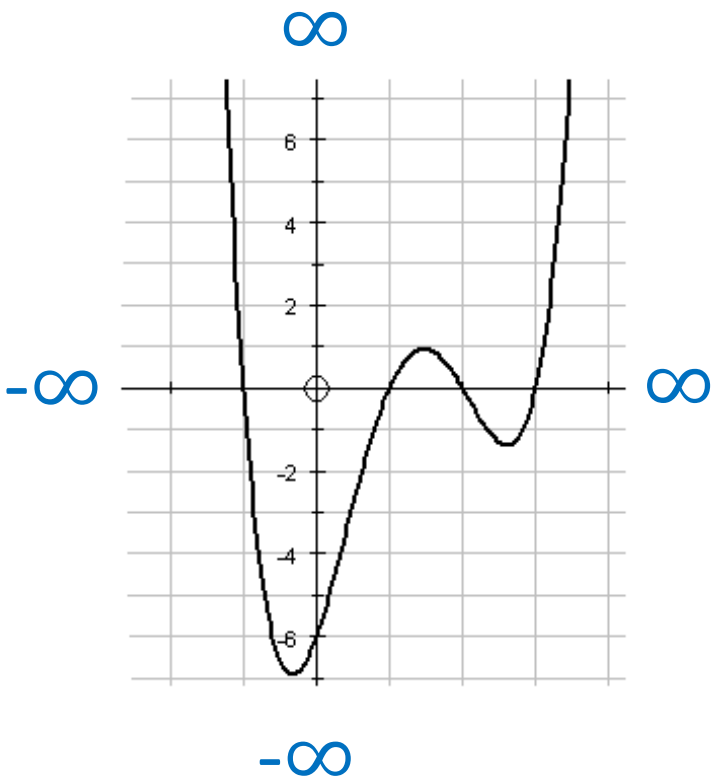
Since we don't have one, the function goes on forever. We say the range interval "ends" at ∞.



So the range of this function is $(1, \infty)$

End Behavior

End behavior describes what goes on at the far ends of the graph.



It's written in the following format

$$x \to \infty, y \to something$$
$$x \to -\infty, y \to something$$

And we say

as x $approaches$ $positive$ ∞, y $approaches$ $something$

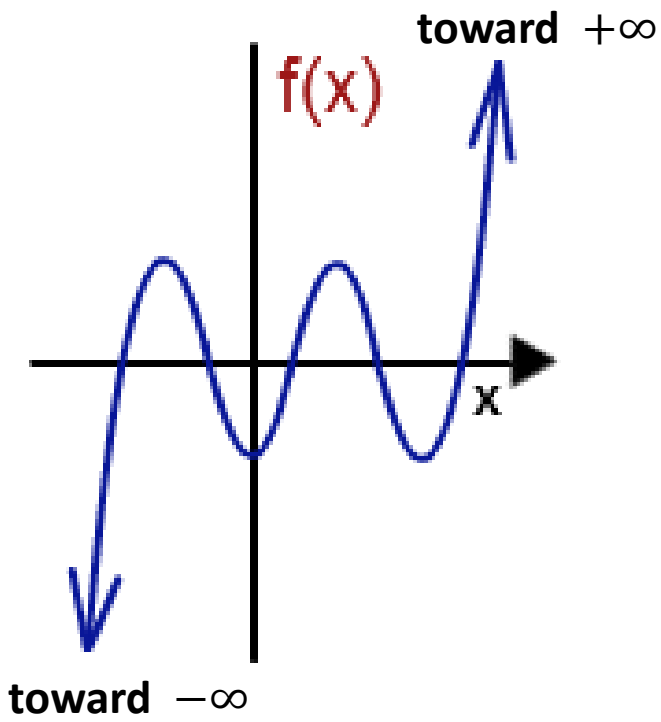
as x $approaches$ $negative$ ∞, y $approaches$ $something$

End Behavior

Look at the far Ends of the graph. There will always be two ends. ☺

If the end is pointing up, it's going toward $+\infty$

If the end is pointing down, it's going toward $-\infty$



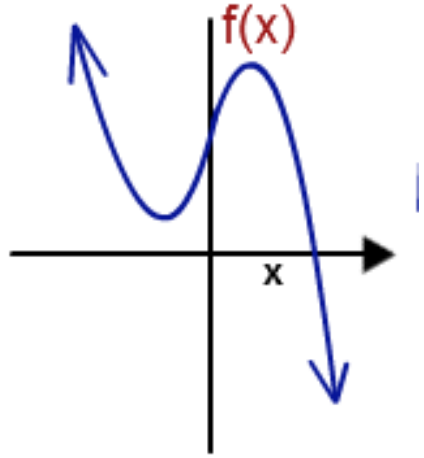
End Behavior

Now let's put it together

We see

As x approaches positive infinity y approaches negative infinity.

As x approaches negative infinity y approaches positive infinity.



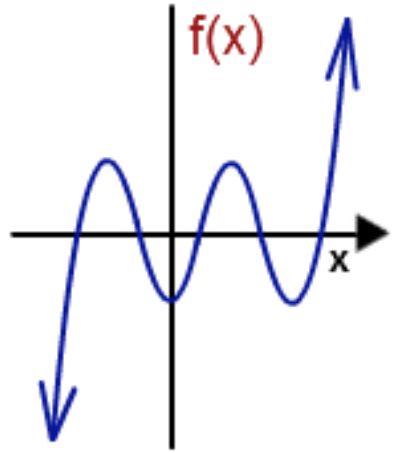
We write

$x \to \infty, y \to -\infty$

$x \to -\infty, y \to \infty$

End Behavior

Now let's put it together



We see

As x approaches positive infinity y approaches positive infinity.

As x approaches negative infinity y approaches negative infinity.

We write

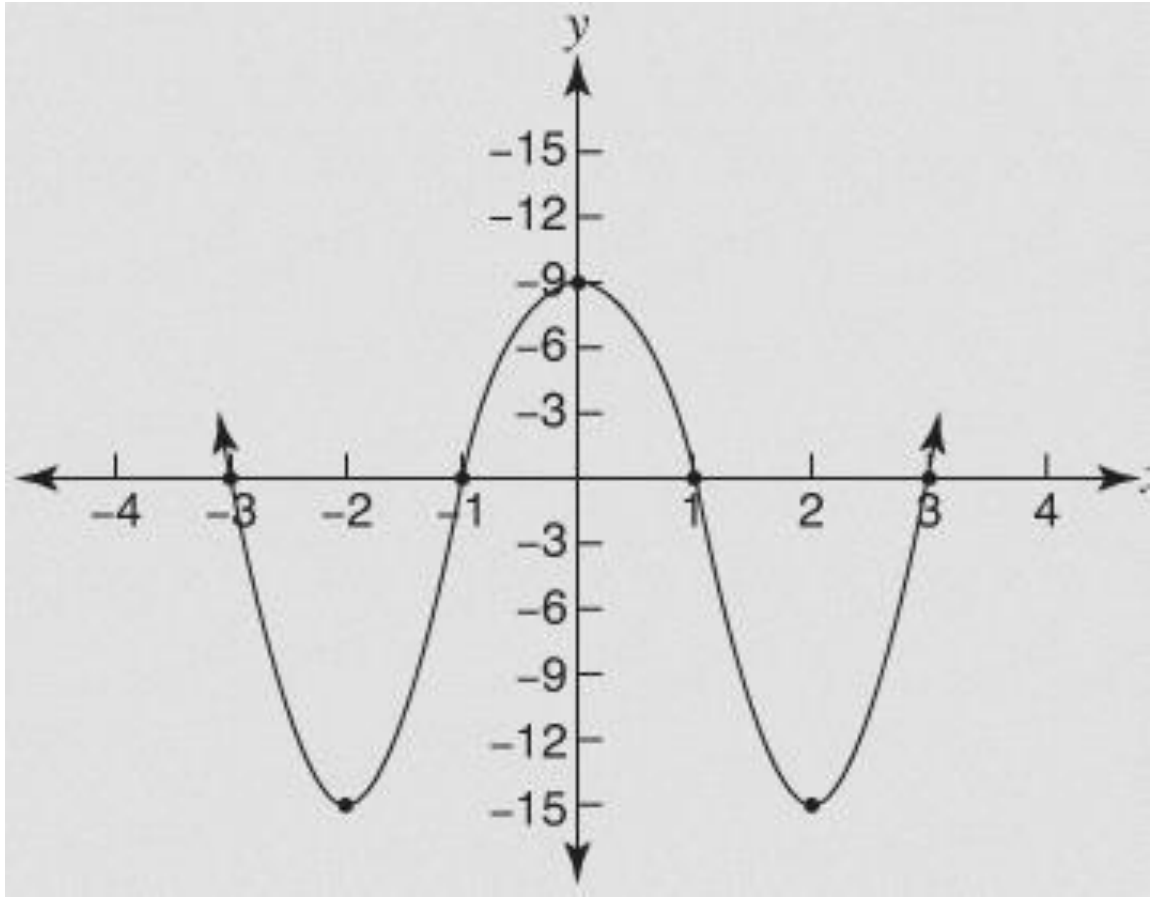
$x \to \infty, y \to \infty$

$x \to -\infty, y \to -\infty$

Wow! That's a lot.

Finish the table from the previous example.

Identify the following	
Maximum(s)	
Minimum(s)	
Increasing Intervals	
Decreasing Intervals	
x Intercepts	
y intercepts	
Domain	
Range	
End Behavior	



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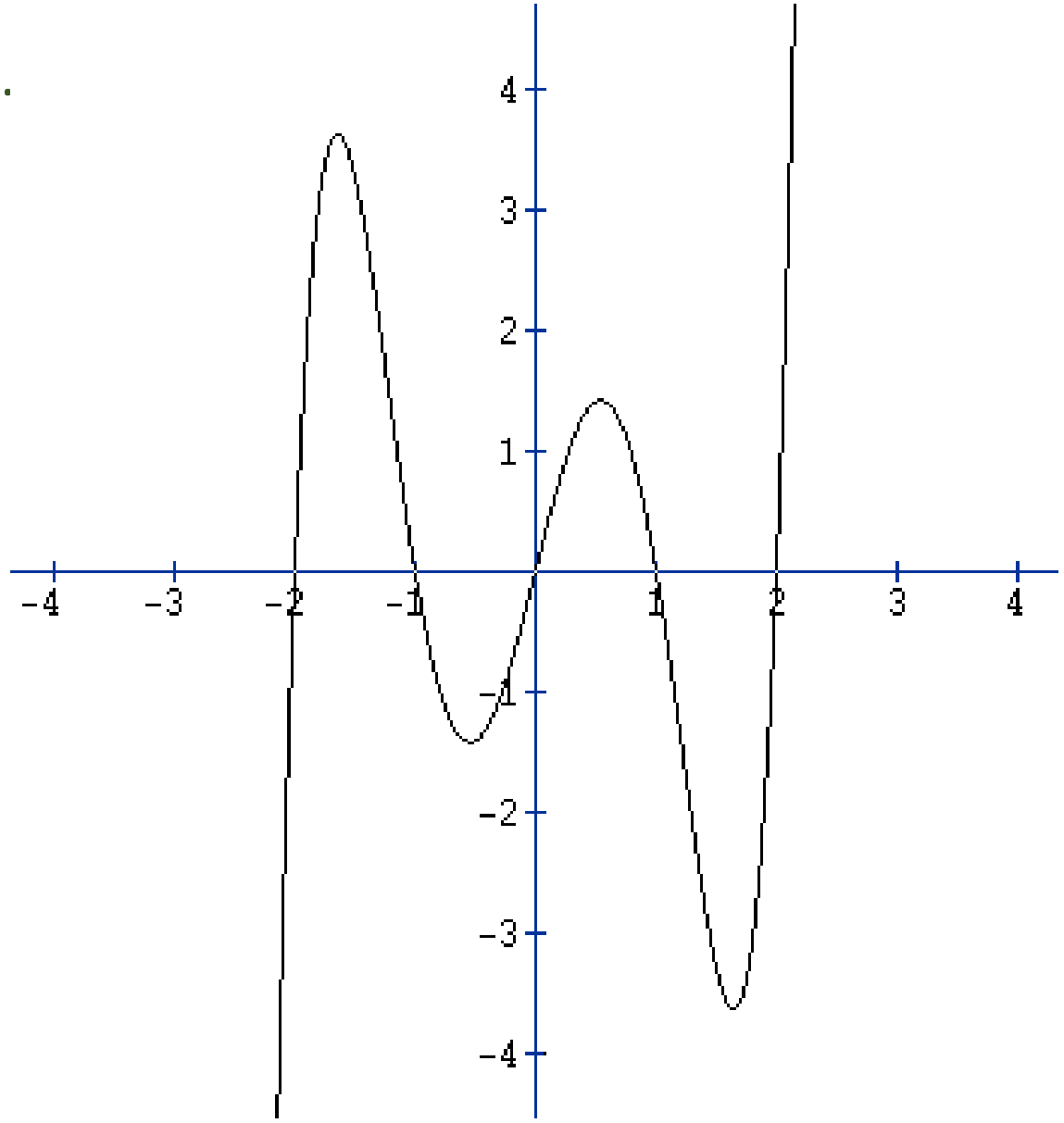

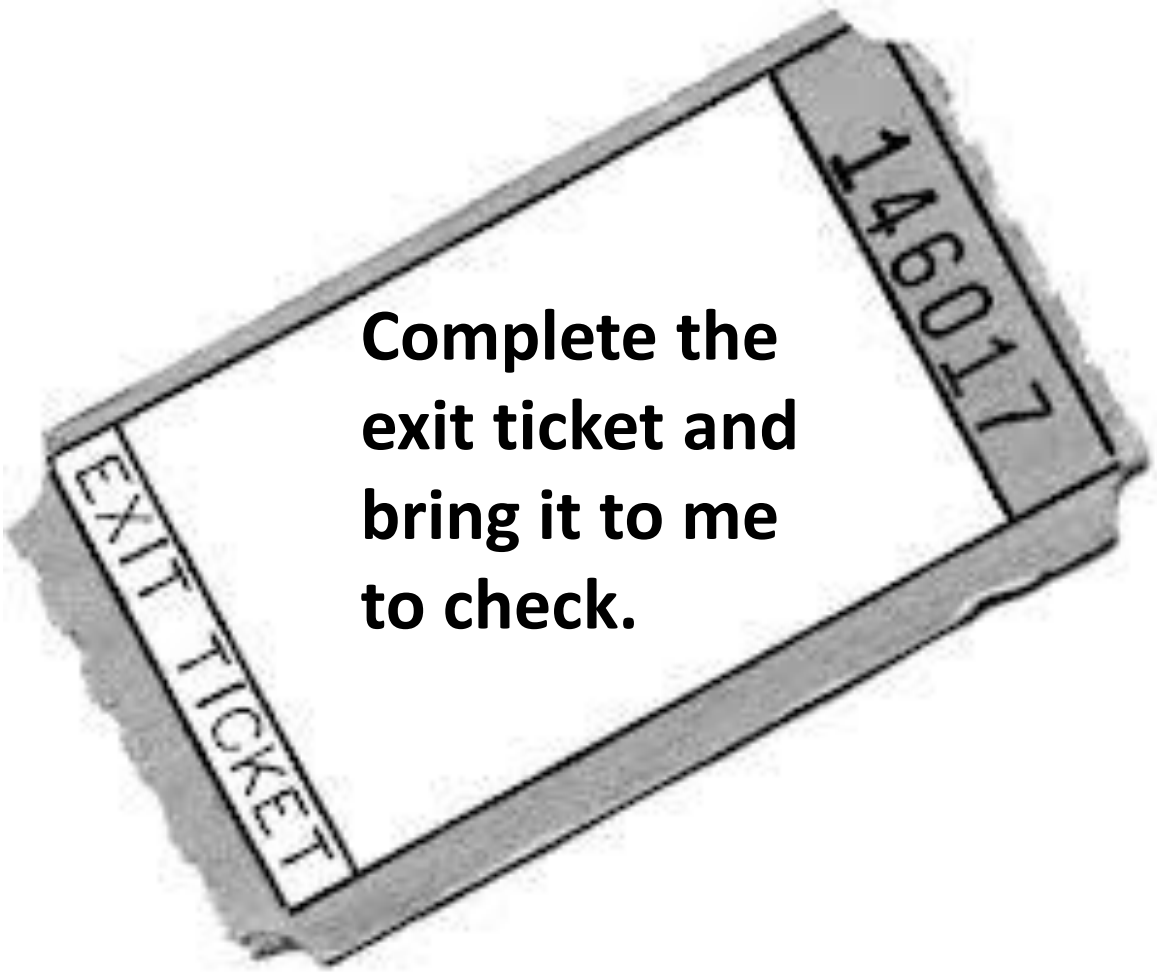
146017
EXIT TICKET
Complete the exit ticket and bring it to me to check.