Warm - Up

Pick up the MATH III Diagnostic test

Rate the difficulty of each problem from 1 -5 as follows:

1 I have no clue
2 I've seen something like this before but I don't know what to do
3 I feel comfortable giving it a try but I probably won't get it right
4 I know this, I can do this but may have some small errors.
5 I got this. Piece of cake.

Write your rating to the left of the problem number.

Homework Questions?

Pearson Website

On-line survey

Pre-Assessment

Don’t Panic!

Complete the Math III Diagnostic Test

30 minutes…

10	10	10
9	9	9
8	8	8
7	7	7
6	6	6
5	5	5
4	4	4
3	3	3
2	2	2
1	1	1

So Far

Function Definition

Graphical and Data representation of Functions

Function notation and evaluation of specific input values

Objectives

Function Characteristics

Define and identify the following for a given function

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

Interpret the above terms as they relate to real world situations.

HOMEWORK

Finish practice problems on the guided notes page

Functions

How do you feel about roller coasters?

Where do you feel the queasiest?

We could create a function that models the height of a rollercoaster in relation to the distance from the starting point of the ride.

Where do you feel most relieved?

Where do you feel the anticipation?

Where do you wish you'd skipped out of line?

Functions

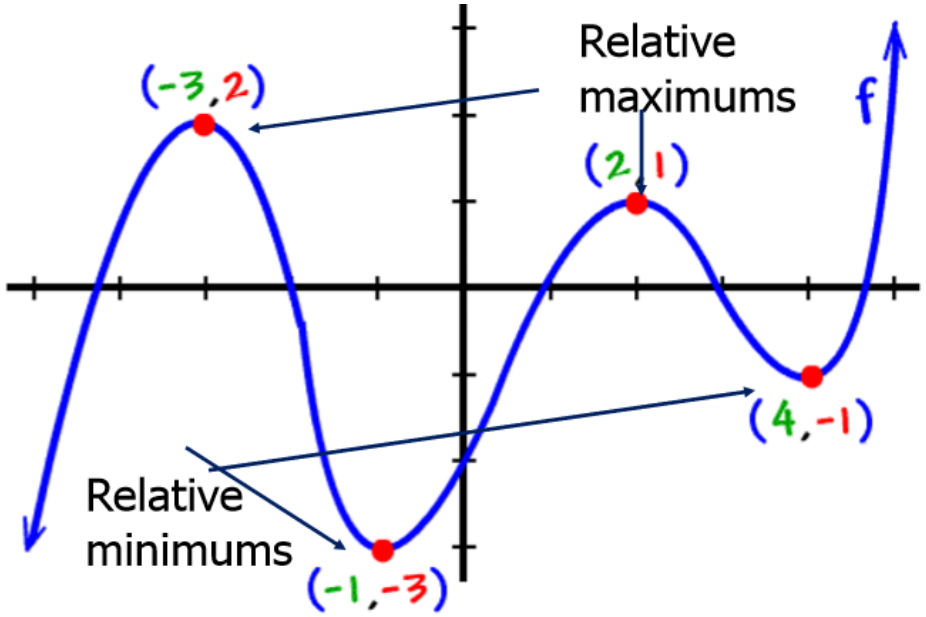
Maximums and Minimums

In Math Speak

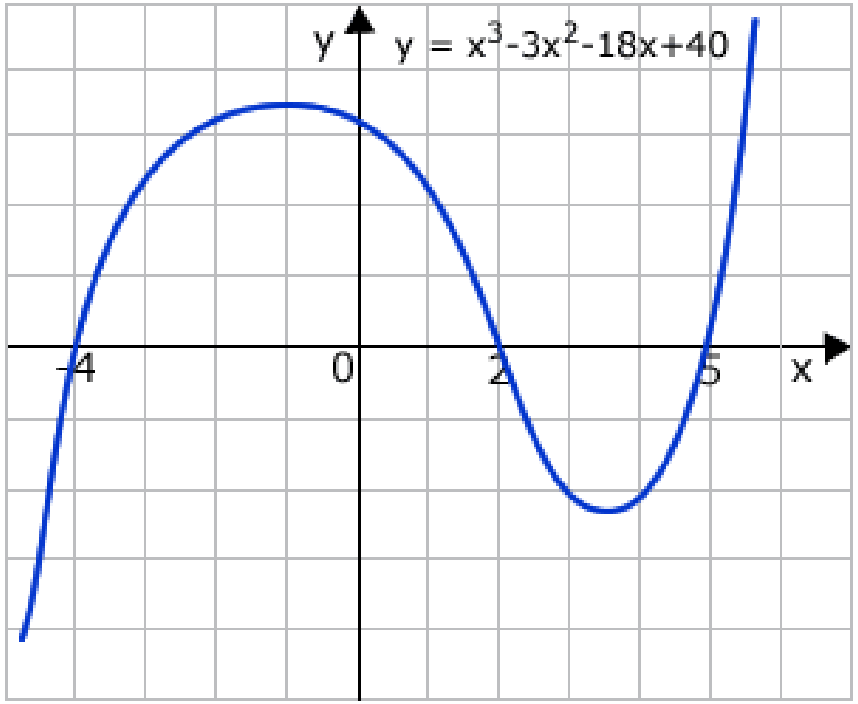
A **maximum** is a the highest point on the peak of a graph

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

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)

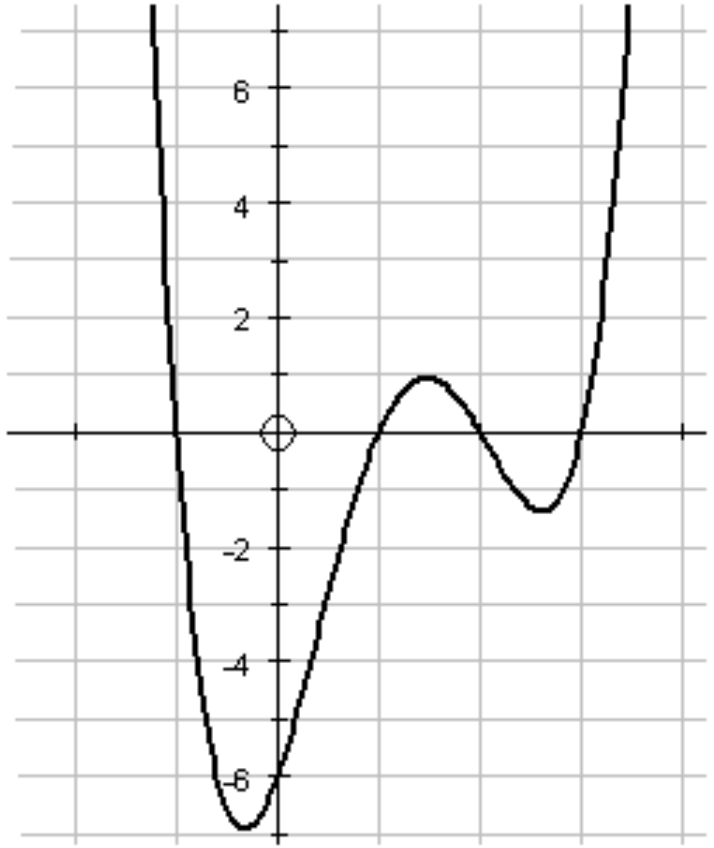
For the following function, identify any minimum(s) or maximum(s).

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

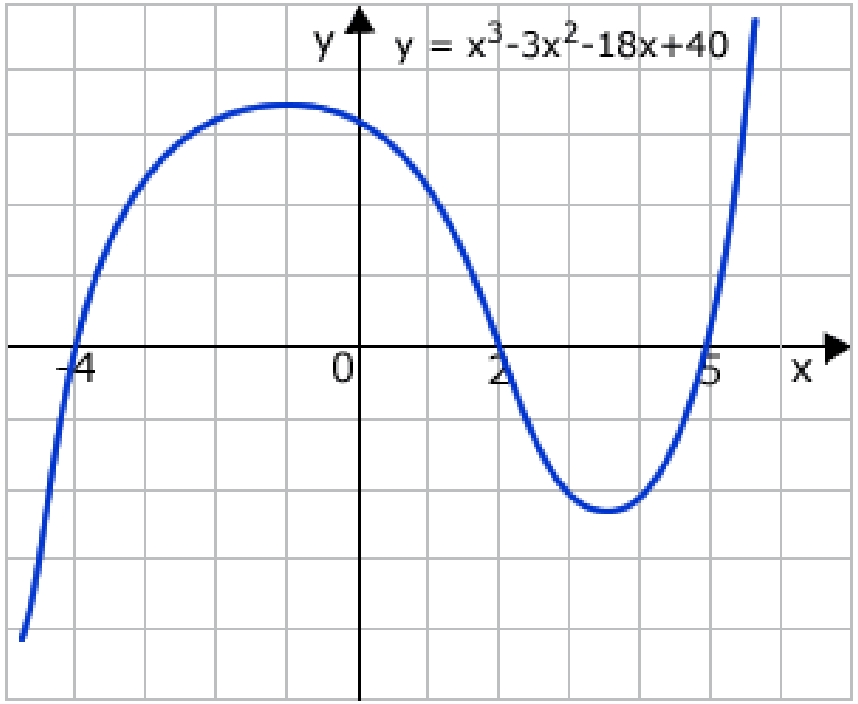
A function *f* is **increasing** on an interval if **as x increases then f(x) increases**

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!

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



Increasing interval(s)

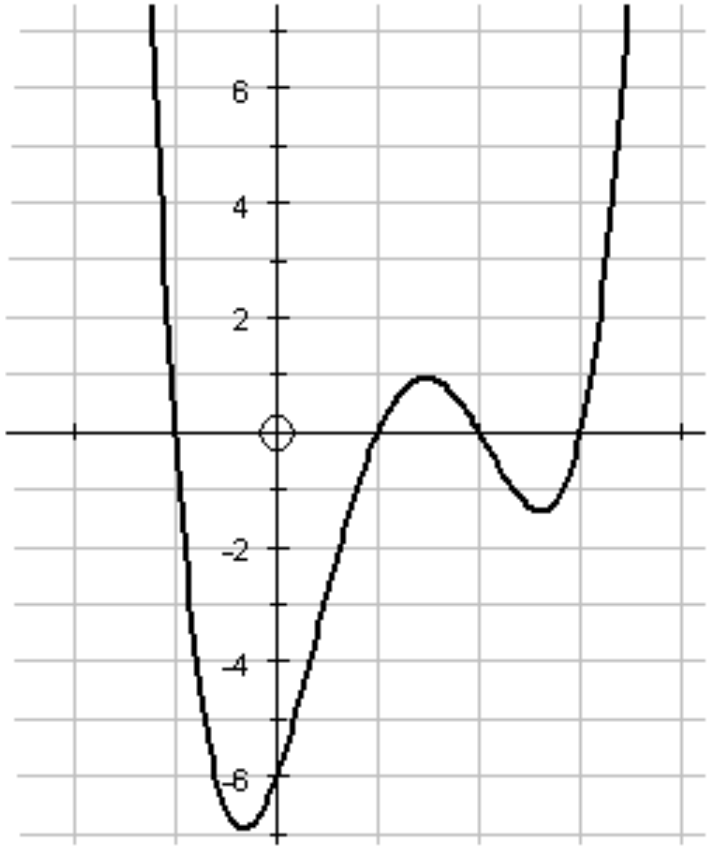
Two intervals, $(-\infty, -1)$ and $(3.5, \infty)$

Decreasing interval(s):

One interval, $(-1, 3.5)$

Functions

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



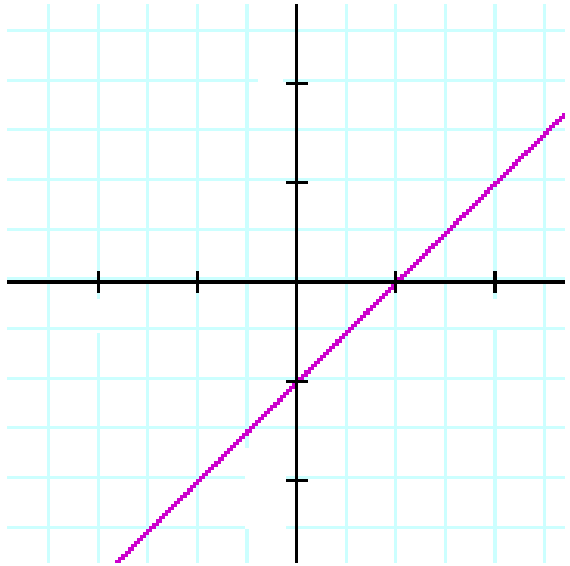
Increasing interval(s)

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

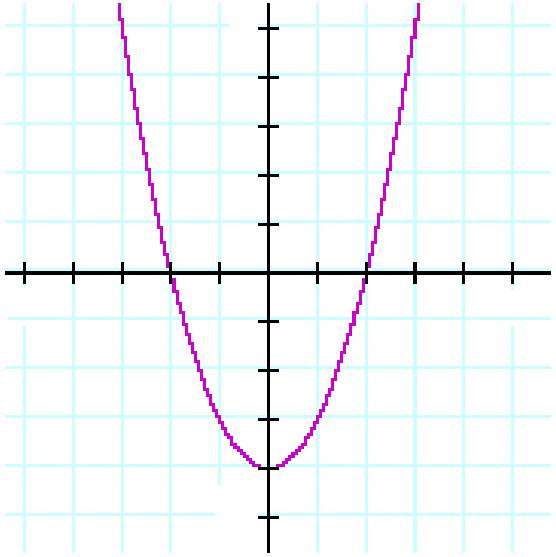
Decreasing interval(s):

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

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

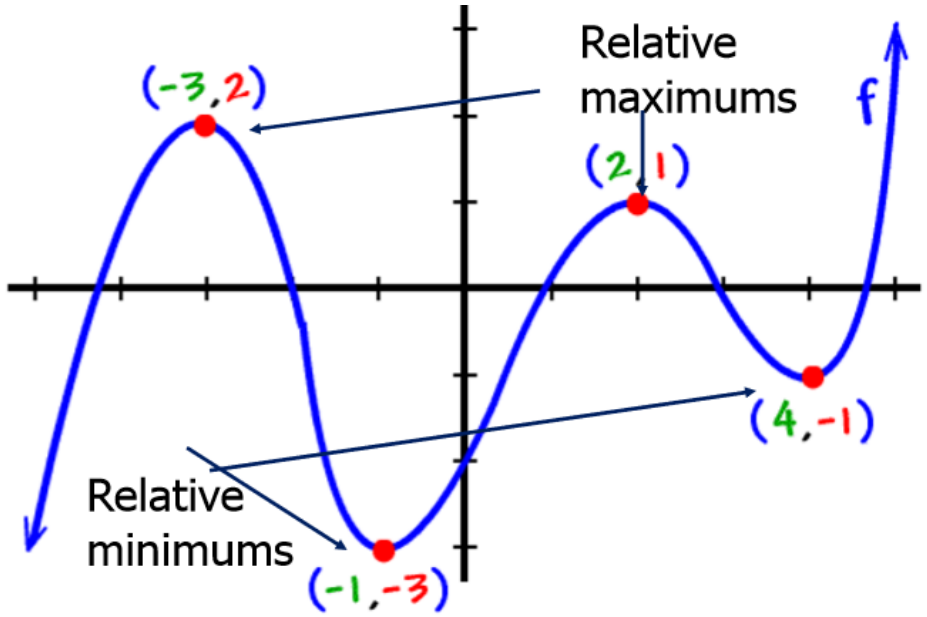


Increasing: $(-\infty,\infty)$
Decreasing: n/a



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

Another word about Maximums and Minimums

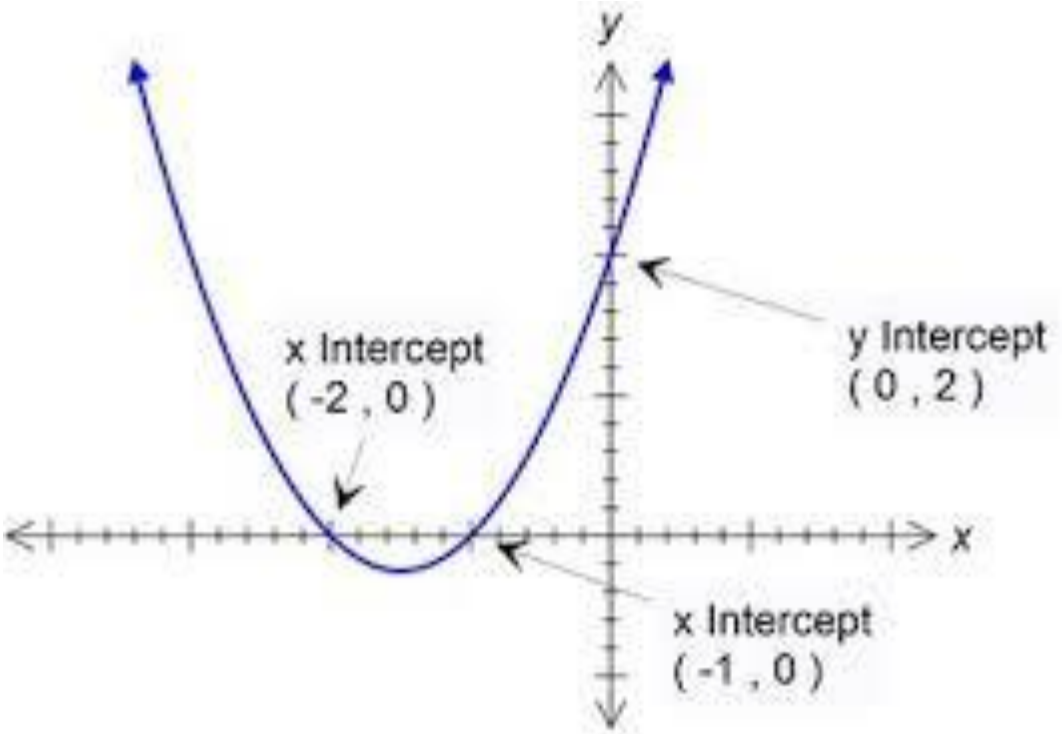


The peaks and valleys are where a function **changes** from increasing to decreasing or vice versa.

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

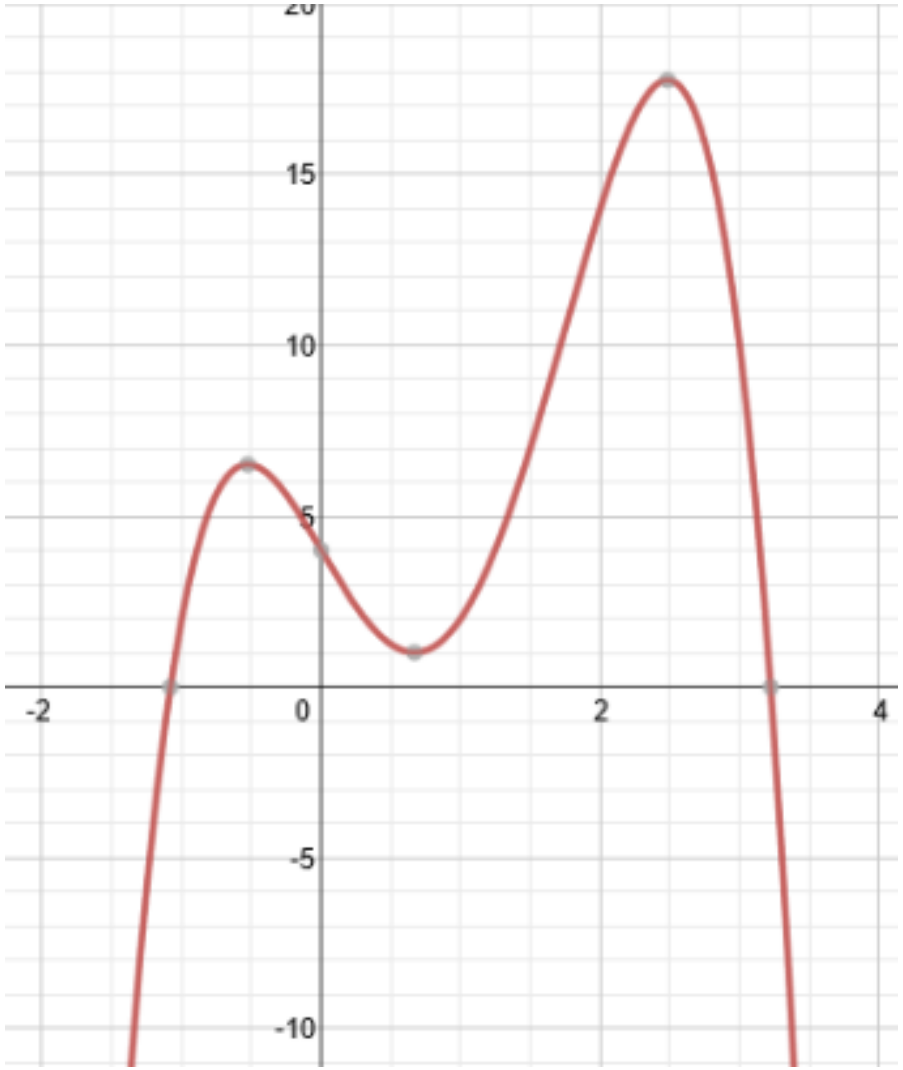
Practice

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

Functions

Practice

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



Domain and Range

Remember this from yesterday?

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

Lets look at Domain first

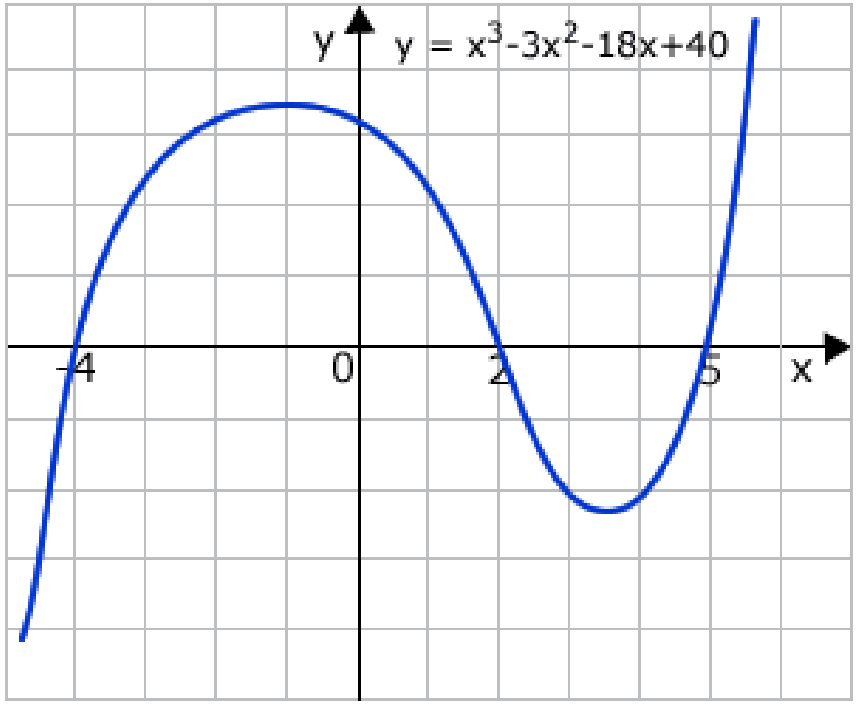
Look at the x axis.

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?

Since we don't have one the we say the domain interval starts at $-\infty$.



Functions

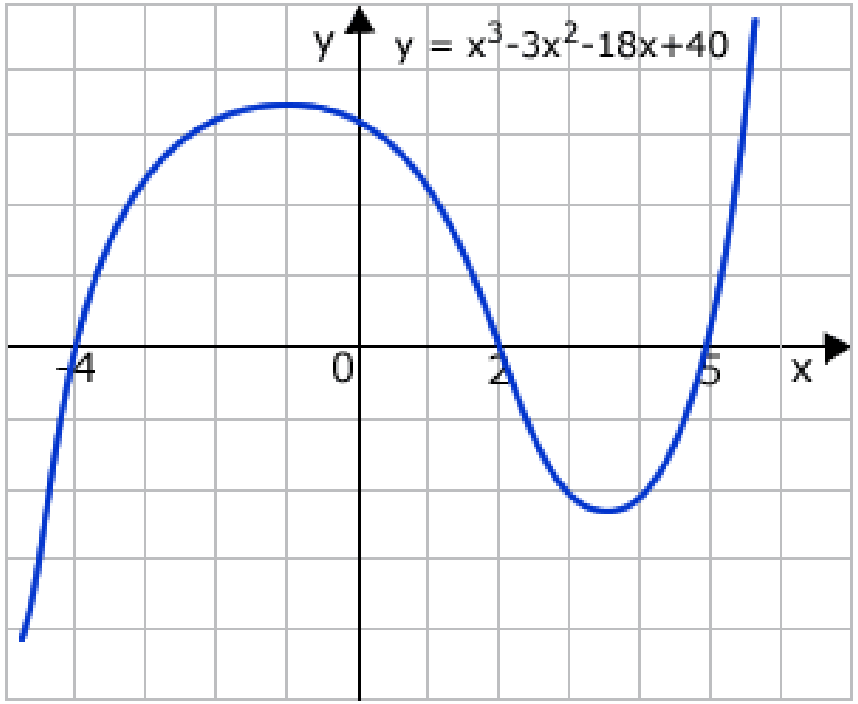
Lets look at Domain first

Look at the x axis.

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 left. We say the domain interval ends at ∞.



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

Range

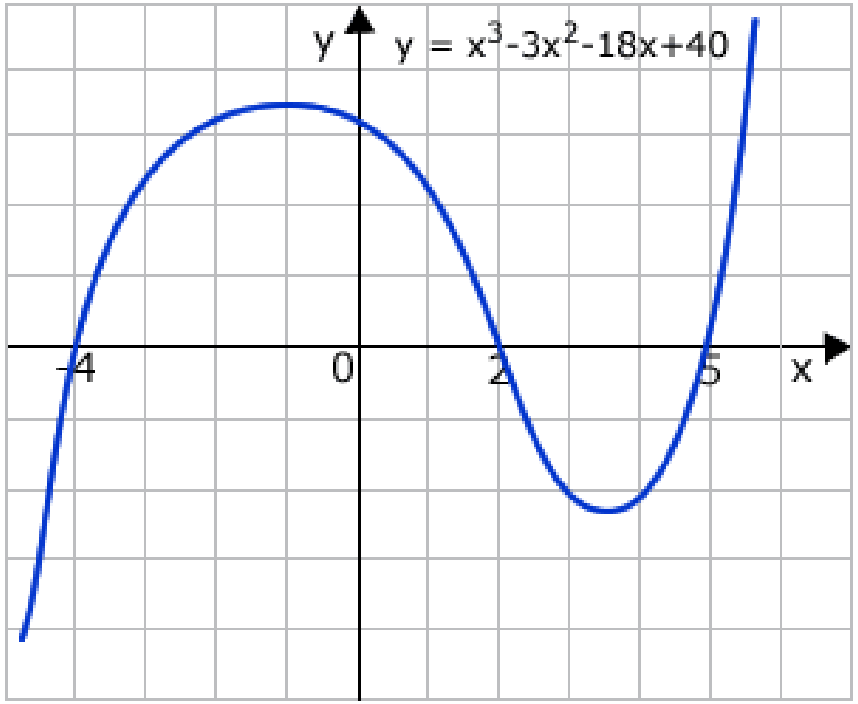
Look at the y axis.

No dot at the end of the line. What does that mean? ☺

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

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

Since we don't have one, we say the range interval starts at $-\infty$.



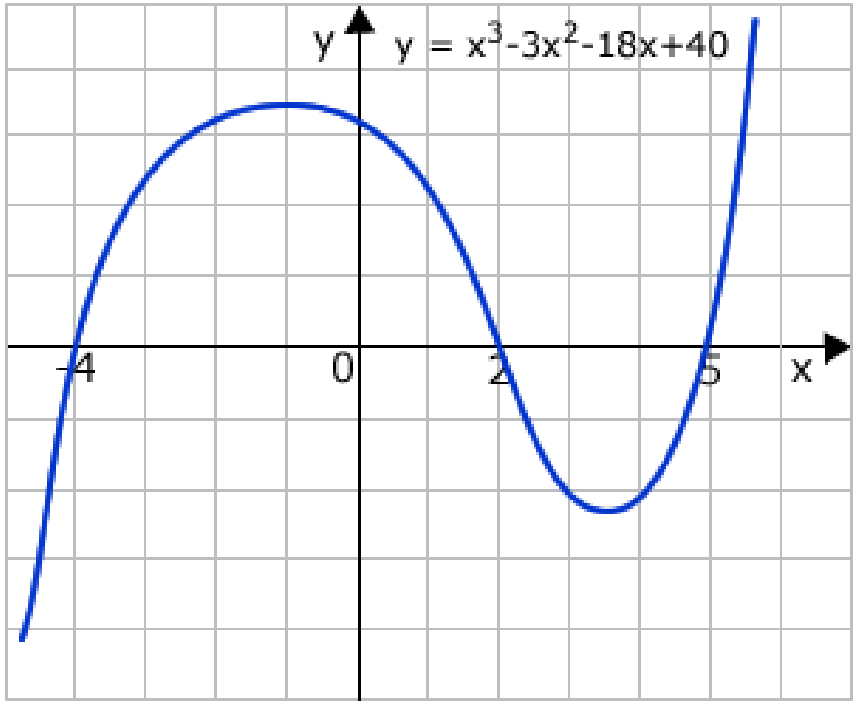
Range

Look at the y axis.

Continue tracing from top to bottom.

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

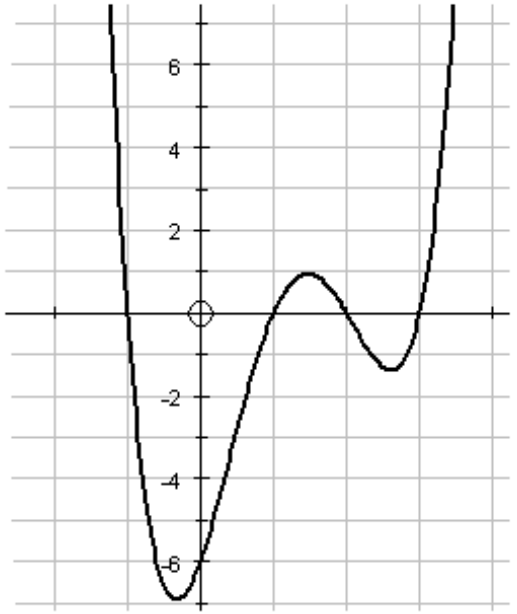
Since we don't have one, the function goes on forever. We say the range interval ends at ∞.



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

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 $approaches$ $something$

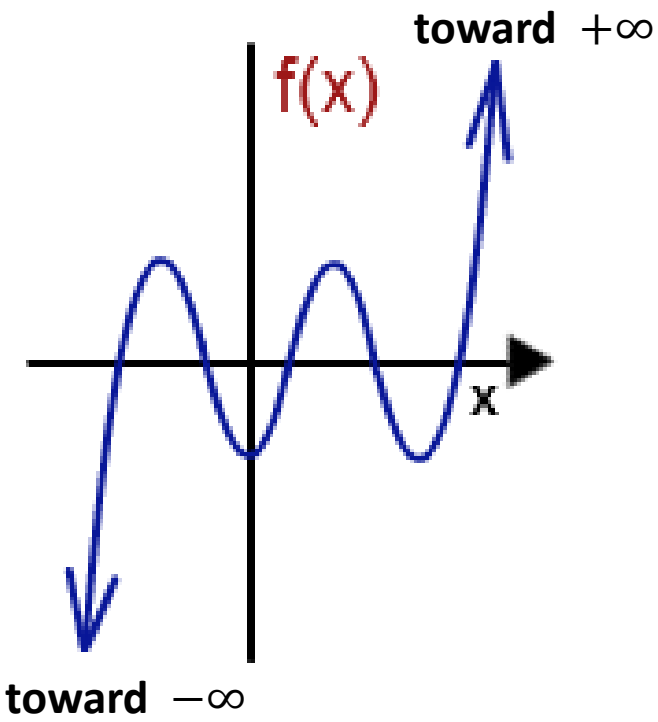
as x $approaches$ $negative$ ∞, y $approaches$ $something$

End Behavior

First, 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 $-\infty$

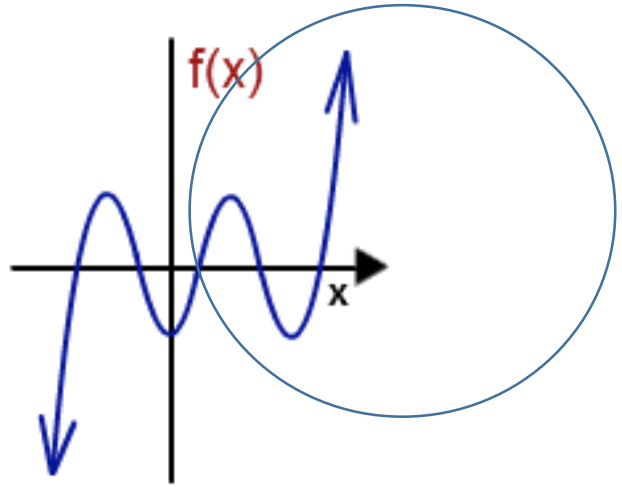


End Behavior

Next, start at the origin and look to the RIGHT. Is the graph pointing up or down? Depending on which way it's pointing…

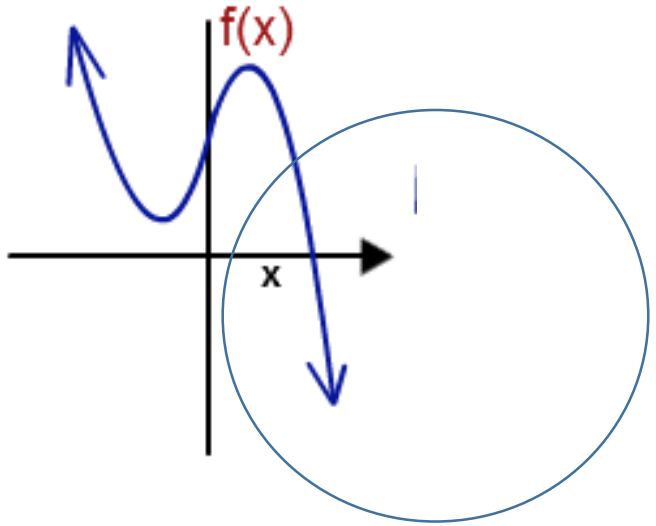
Up: As x approaches positive infinity y approaches positive infinity. We write

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



Down: As x approaches positive infinity y approaches negative infinity. We write

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

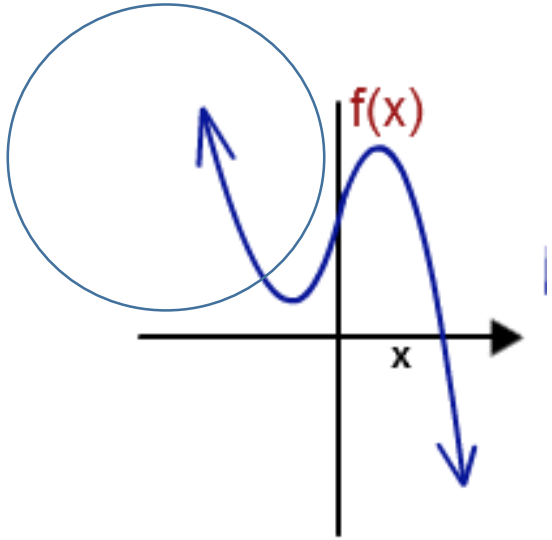


End Behavior

Next, start at the origin and look to the LEFT.
Is the graph pointing up or down? Depending on which way it's pointing…

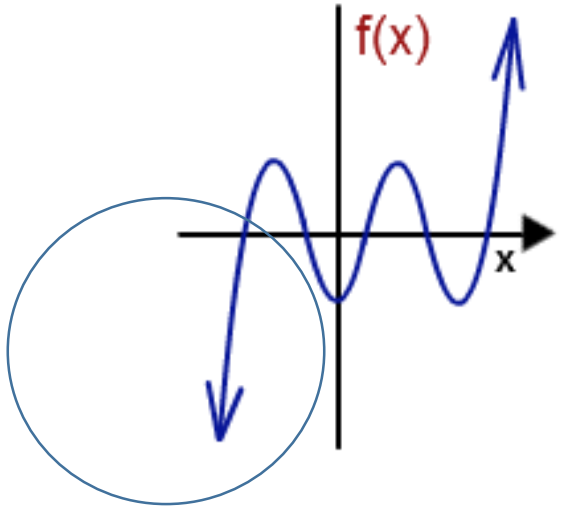
Up: As x approaches negative infinity y approaches positive infinity. We write

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



Down: As x approaches negative infinity y approaches negative infinity. We write

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



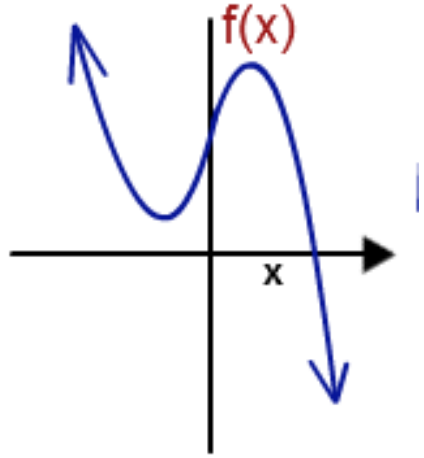
End Behavior

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.



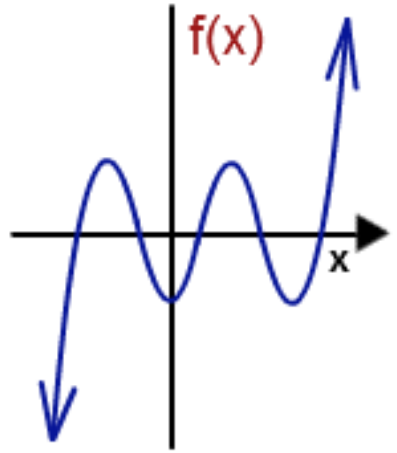
We write

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

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

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.

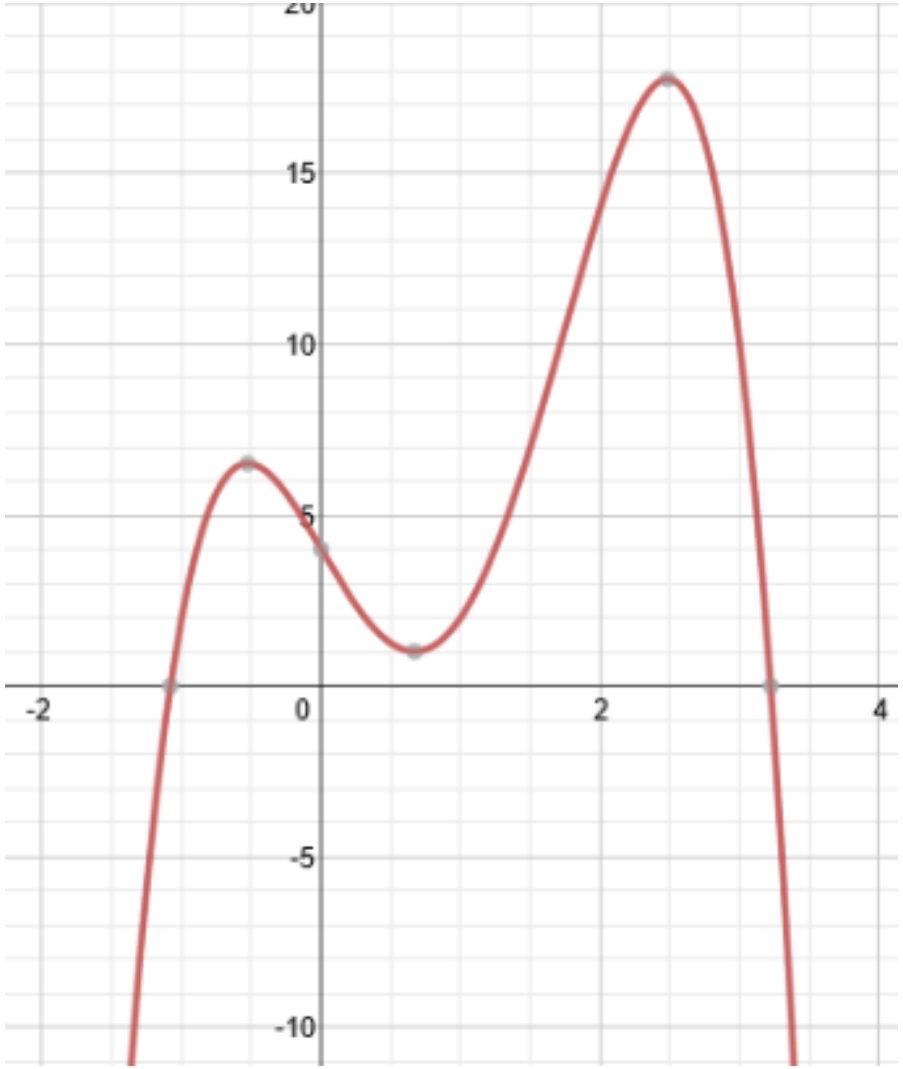
Identify the following	
Maximum(s)	(1.1,12)
Minimum(s)	(3.5,-2)
Increasing Intervals	$(-\infty, 1.1)$ $(3.5,\infty)$
Decreasing Intervals	(1.1,3.5)
x Intercepts	(0,0), (3,0), (4,0)
y intercepts	(0,0)
Domain	
Range	
End Behavior	

Functions

Wow! That's a lot.

Finish the table from the previous example.

Identify the following	
Maximum(s)	$(-0.5, 1.5)$, $(2.5, 18)$
Minimum(s)	$(0.6, 1)$
Increasing Intervals	$(-\infty, -0.5)$, $(0.6, 2.5)$
Decreasing Intervals	$(-0.5, 0.6)$ $(2.5, \infty)$
x Intercepts	(-1, 0), (3.25,0)
y intercepts	none
Domain	
Range	
End Behavior	



Did we meet our objectives?