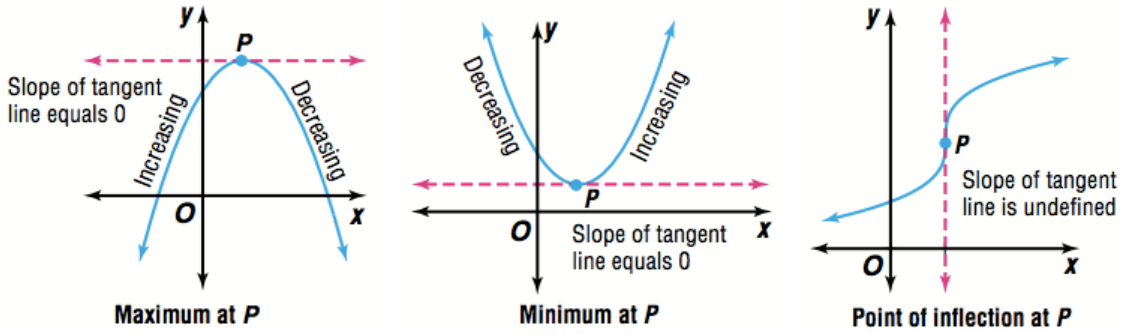
Critical Points and Extrema
Lesson 13
10.13.15
Warm-up

Use a graphing calculator and sketch a graph:

1)$y = x^4 + 2x^3 - 3x + 2$
2) $y = -x^3 + 3x$
3)$y = -2x^2 - 5x + 1$

Critical Points are those points on a graph at which a line drawn tangent to the curve is horizontal or vertical. A critical point may be a **maximum**, **minimum**, or a **point of inflection.**



Absolute Maximum is the greatest value that a function assumes over its domain.

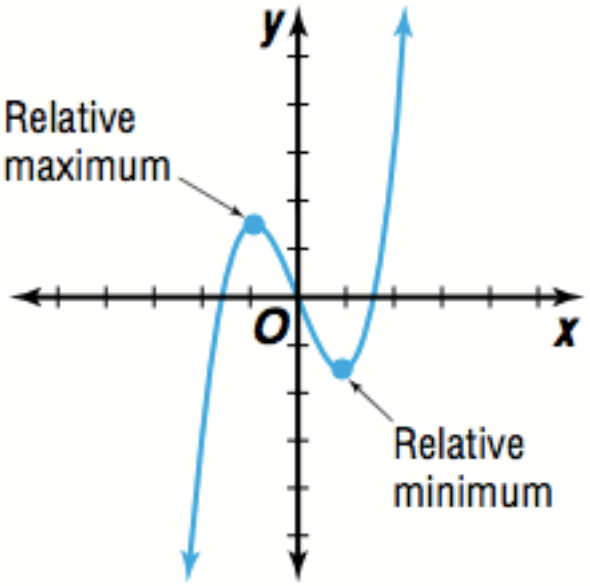
Absolute Minimum is the least value that a function assumes over its domain.

Extremum is the general term for Maximum and Minimum.

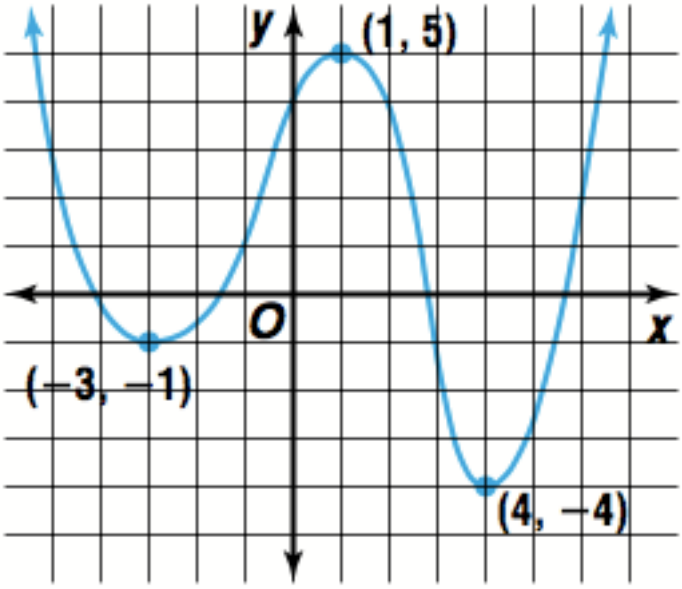
Relative Maximum is the value of a function that may not be the greatest value on the domain, but it is the greatest y-value on the interval of the domain.

Relative Minimum is the least y value on some interval of the domain.

What is the difference between relative and maximum?

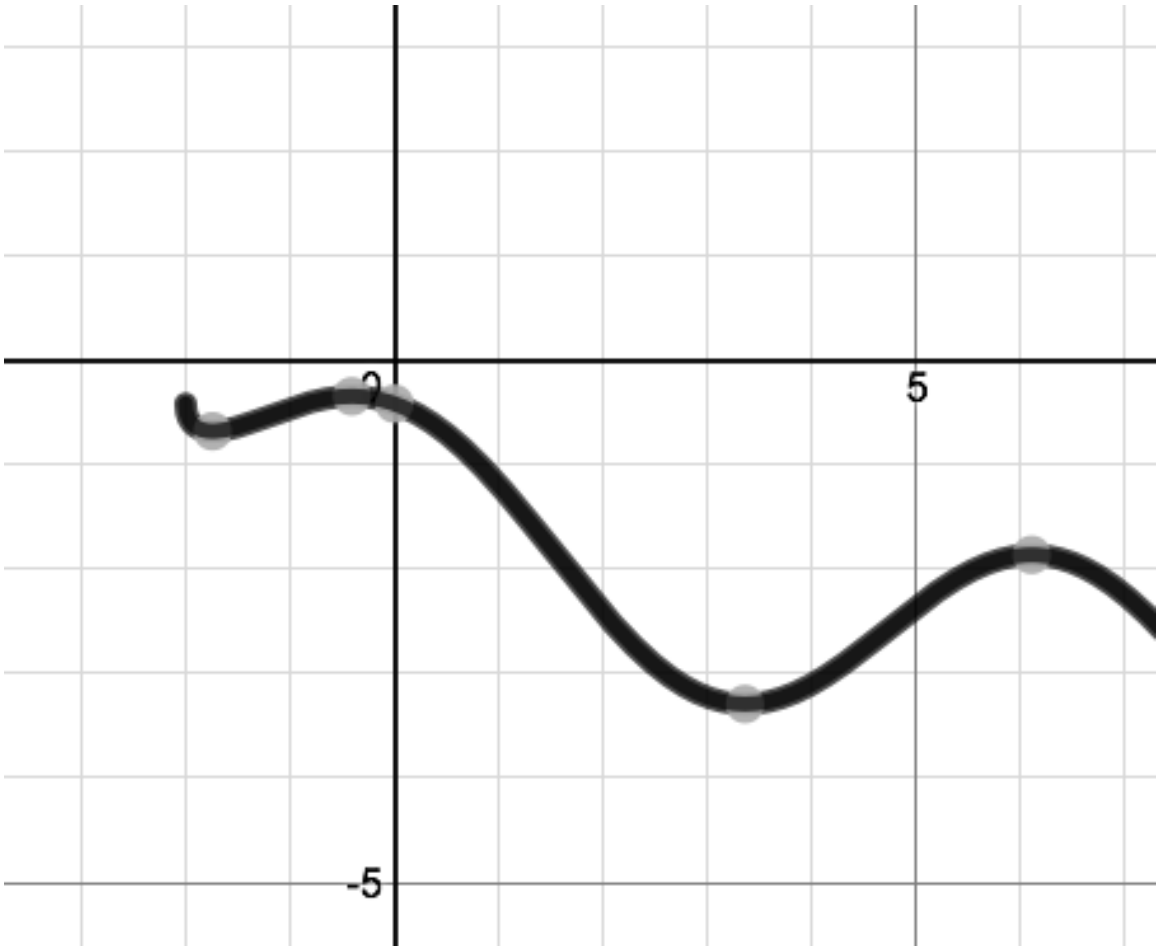


I Try:

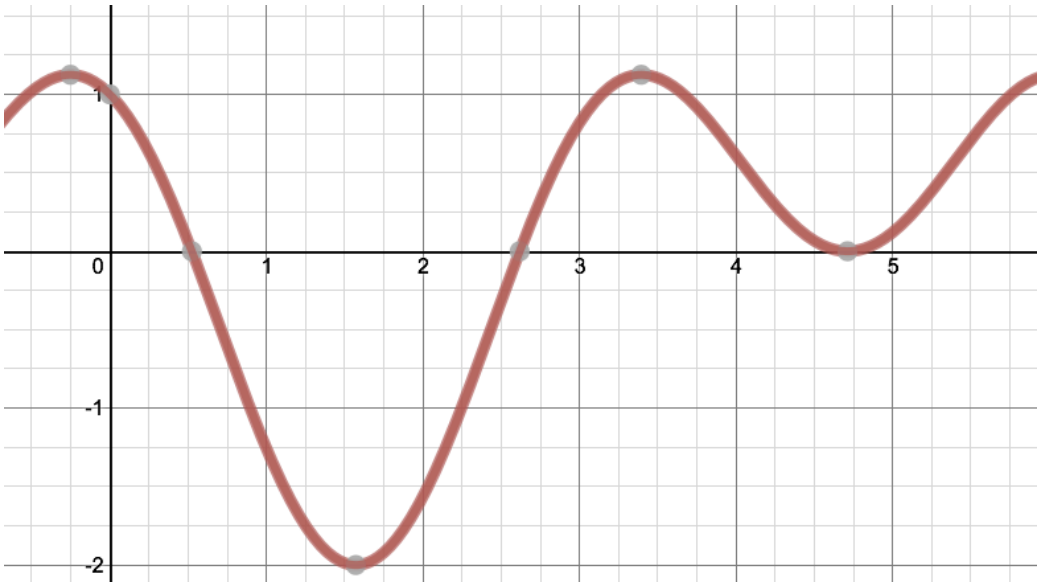


Local Maximum:
Local Minimum:
Absolute Minimum:
Point of Inflection:

We Try:
Local Maximum:
Local Minimum:
Absolute Minimum:
Absolute Maximum:



We Try:
Local Maximum:
Local Minimum:
Absolute Minimum:
Absolute Maximum:



With your 12 o clock partner. Use a graphing calculator, sketch the graph and identify local maximum or local minimum points. If there are more than 1 max or min identify at least 2. Write the window size.

Example:

$$y = x^3 + cos\ 2x + x^4$$

1)$y = x^2 - 15x + 5$

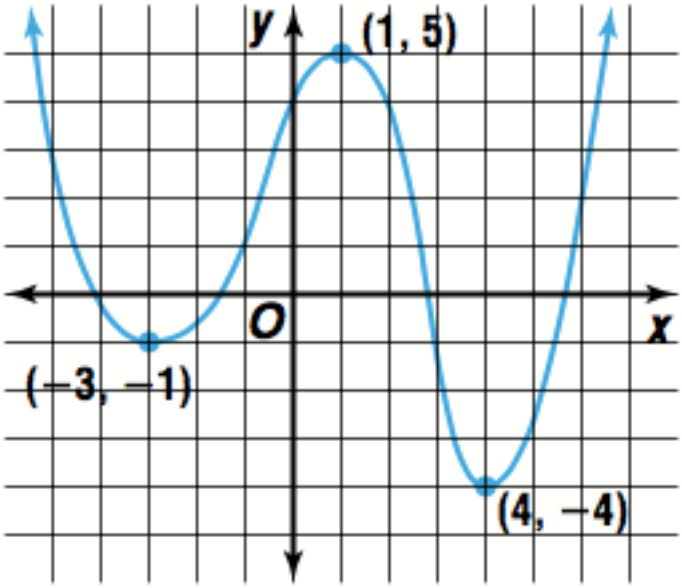
2)$y = -3x^3 + 4x$

3)$y = cosx + 3$

4)y=$2x^4 - 3x^3$

5)$2sinx - x$

Intervals of increasing and decreasing.



Where are the increasing parts of the graph?

Where are the decreasing parts of the graph?
Sketch and label the intervals of increasing and decreasing.

The Critical Points help identify changes in increasing or decreasing intervals.

Determine whether the given critical point is the location of a **maximum**, a **minimum**, or a **point of inflection** without graphing.

1) $y = x^4 - 2x^2 + 7; \quad x = 0$

2) $y = x^3 - 9x^2 + 27x - 27; \quad x = 3$

With your 9 o clock partner, solve 26-29 on a piece of binder paper.

26. $y = x^3, x = 0$

27. $y = -x^2 + 8x - 10, x = 4$

28. $y = 2x^2 + 10x - 7, x = -2.5$

29. $y = x^4 - 2x^2 + 7, x = 0$

30. $y = \frac{1}{4}x^4 - 2x^2, x = 2$

31. $y = x^3 - 9x^2 + 27x - 27, x = 3$

32. $y = \frac{1}{3}x^3 + \frac{1}{2}x^2 - 2x + 1, x = -2$

33. $y = x^3 - x^2 + 3, x = \frac{2}{3}$