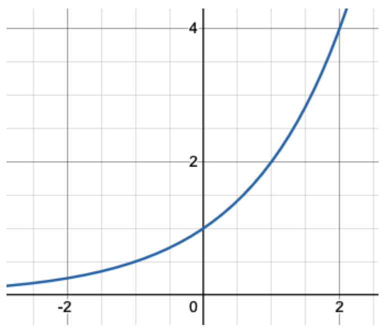
Precalculus 2.1 Key Points

Describing Functions:

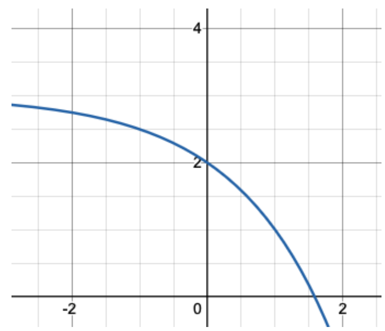
- Increasing/Decreasing

A function is increasing if it has a positive slope, so increasing the x-values also increases the y-values on that interval. Likewise, a decreasing function will have a negative slope and smaller y-values when x increases

Increasing



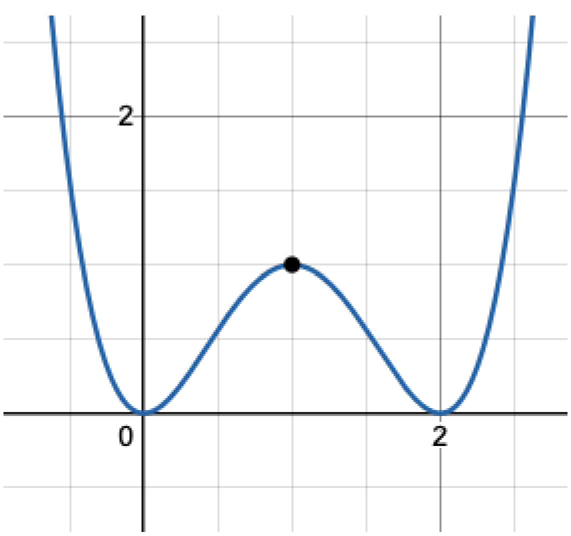
Decreasing



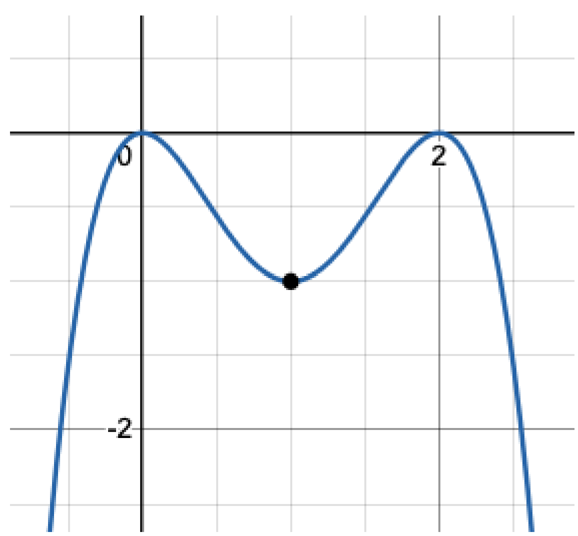
- Maximums/Minimums

A function has a local minimum at the point where it changes from decreasing to increasing, and a local maximum at the point where it changes from increasing to decreasing. The global maximum or minimum of a function (often on an interval) is the largest or smallest possible value of the function. The maximums and minimums of a function are called its extrema.

Local Maximum

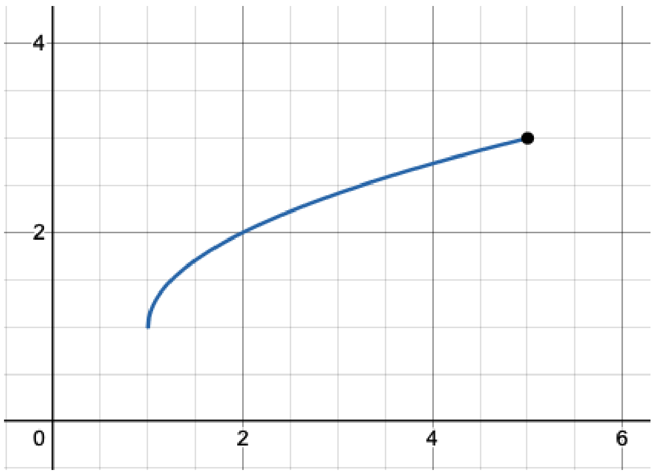


Local Minimum

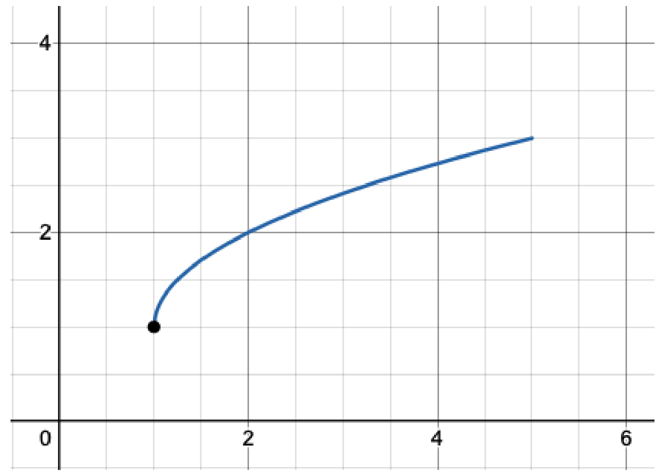


Precalculus 2.1 Key Points

Global Maximum



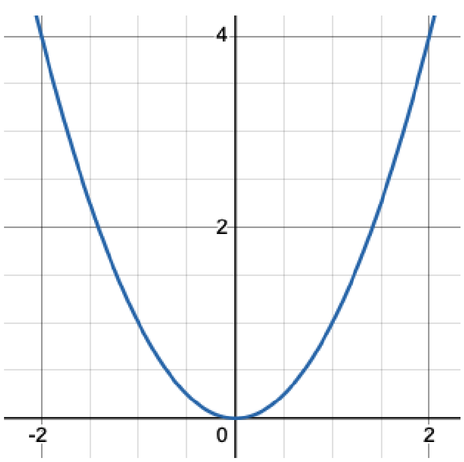
Global Minimum



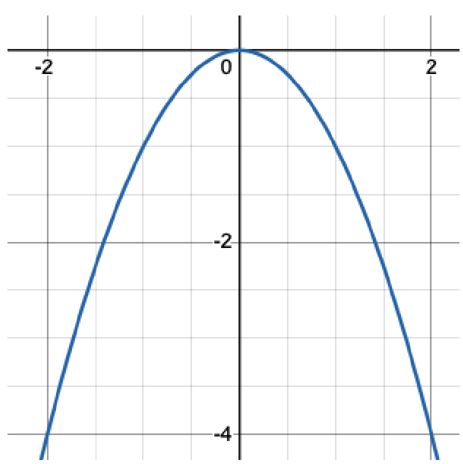
- Concave Up/Concave Down

A function is concave up on an interval if it curves upward and if you connect two points in that interval, they will form a line that is above the graph of the function. Similarly, a function is concave down if it curves downward and if you connect two points in that interval, they will form a line that is below the graph of the function. A point of inflection (or inflection point) is where a function changes concavity.

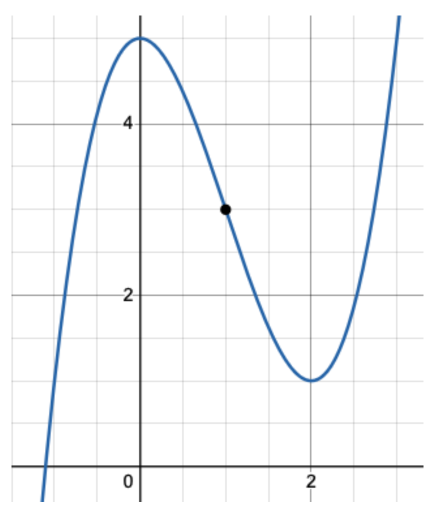
Concave Up



Concave Down

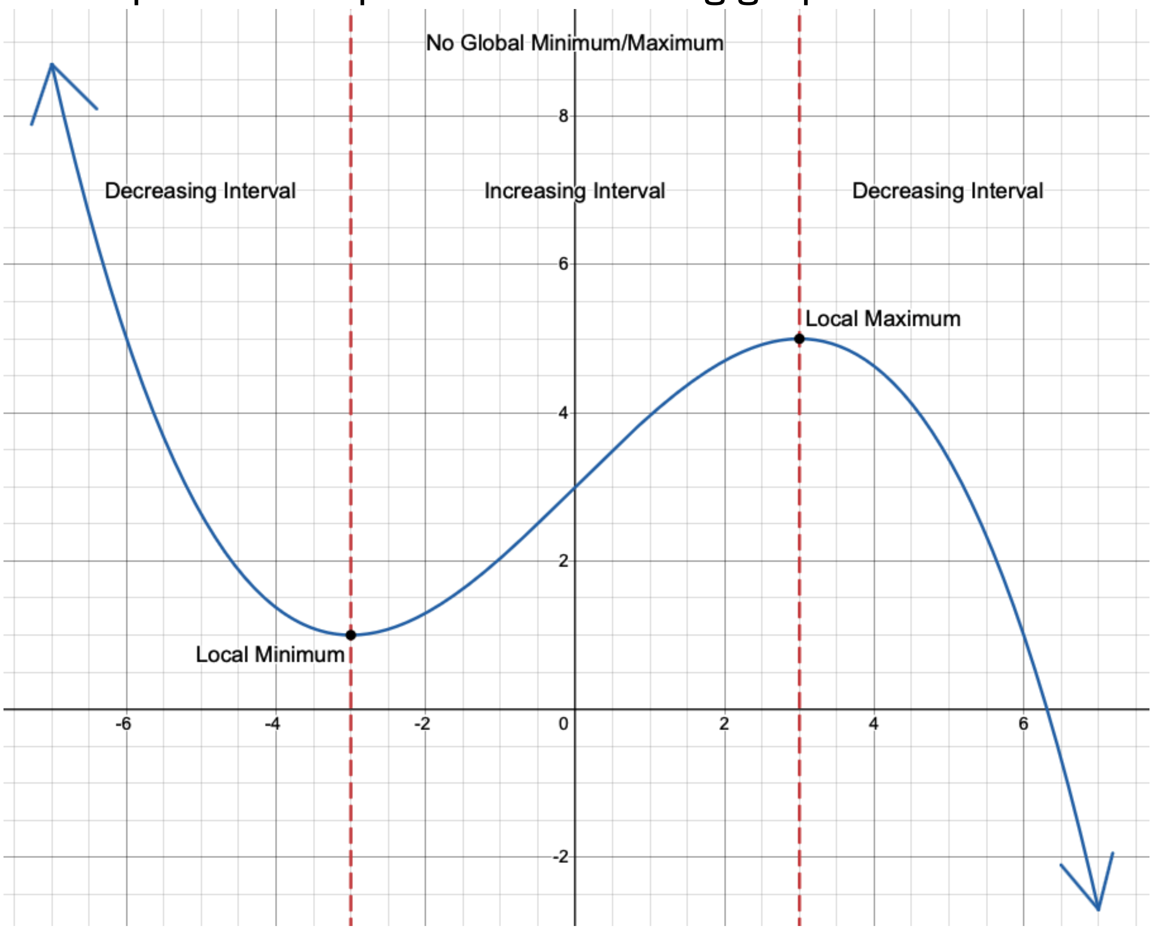


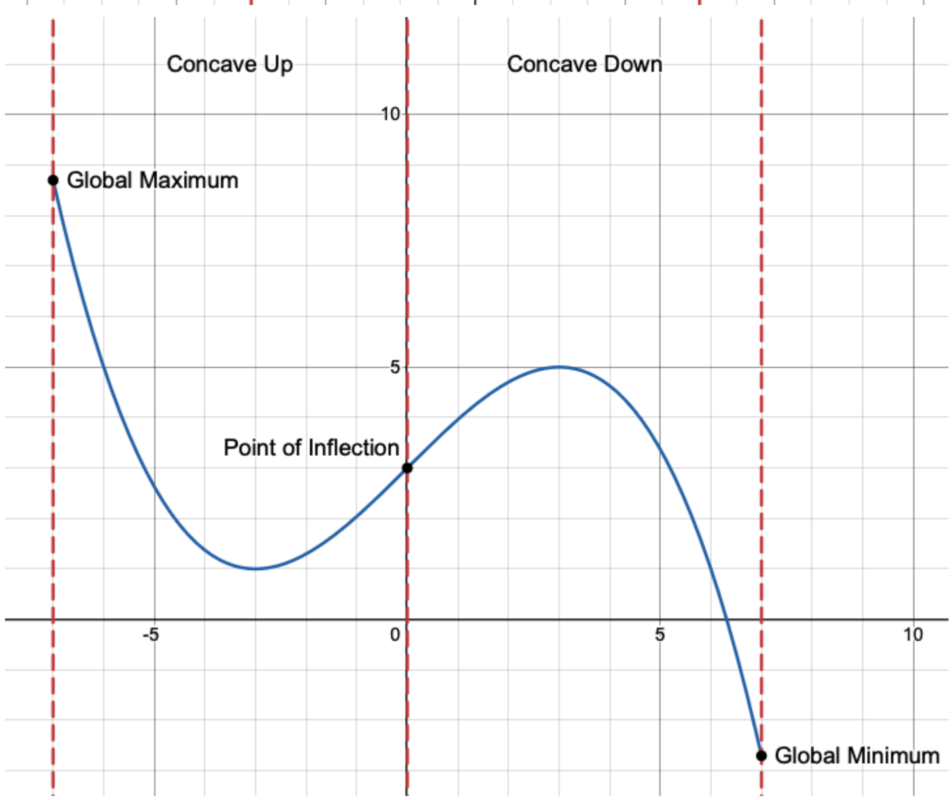
Point of Inflection



Precalculus 2.1 Key Points

Here are a couple of examples characterizing graphs with these features:



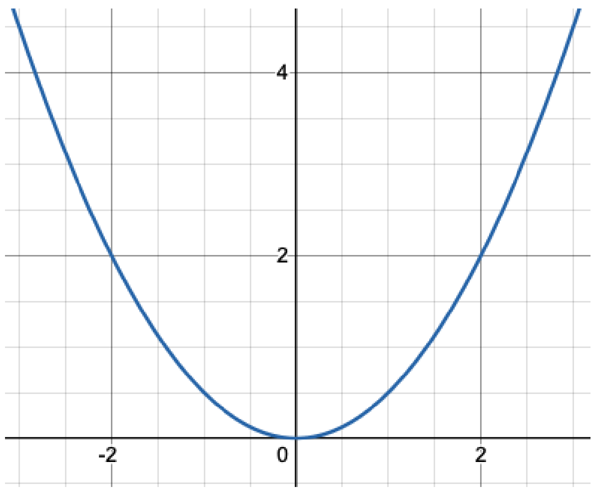


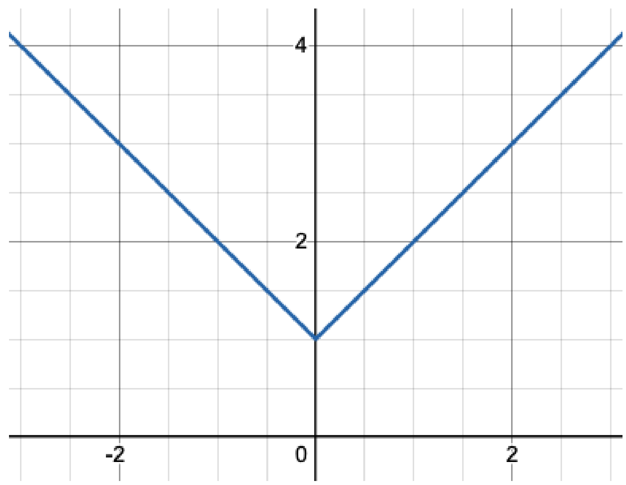
Researched & Developed by: Pi-Rates Add to your knowledge

Precalculus 2.1 Key Points

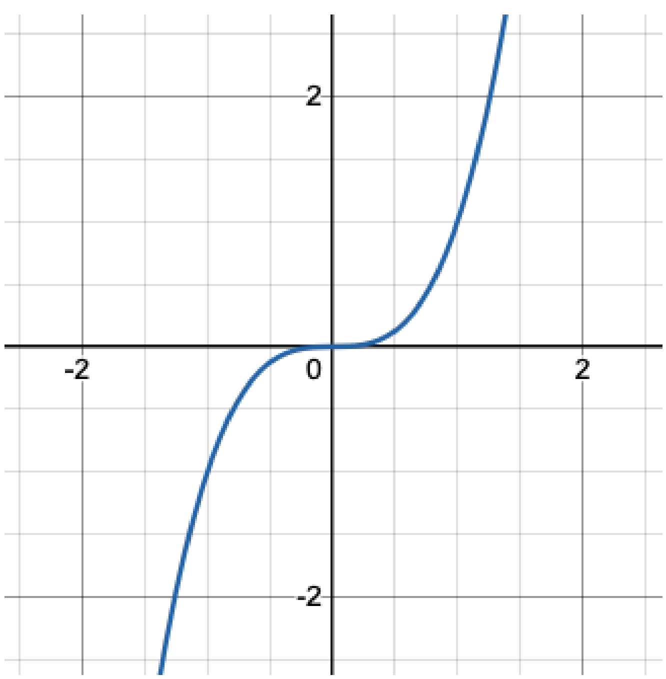
Even and Odd Functions:

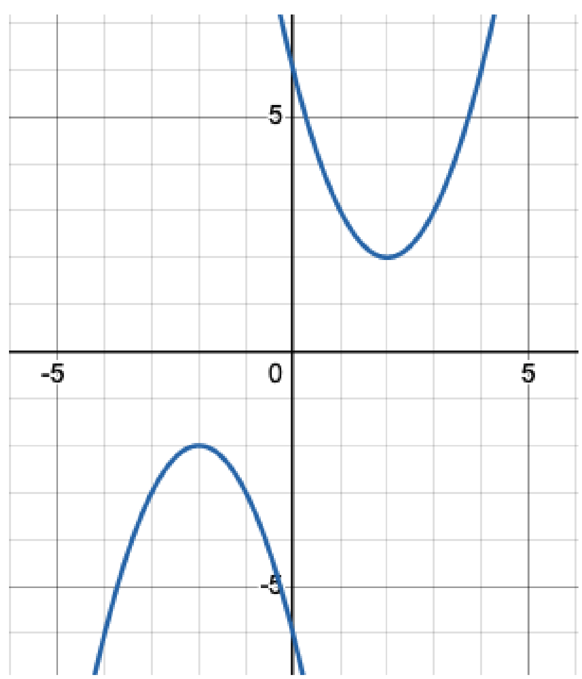
Even functions are symmetrical about the y-axis and flipping the graph across the y-axis will result in the same graph





Odd functions are symmetric to the origin and rotating the graph by $180°$ about the origin will result in the same graph





Precalculus 2.1 Key Points

To determine whether a function is even, odd, or neither algebraically, plug in $-x$ into the function $f(x)$. If the result is $f(x)$, then the function is even. If the result is $-f(x)$, then the function is odd. Otherwise, it is neither even nor odd.

Examples:

$f(x) = x^2$ $f(-x) = (-x)^2$ $f(-x) = (-x)(-x)$ $f(-x) = x^2$ $f(-x) = f(x)$ This function is even	$f(x) = x^3$ $f(-x) = (-x)^3$ $f(-x) = (-x)(-x)(-x)$ $f(-x) = -x^3$ $f(-x) = -f(x)$ This function is odd	$f(x) = 3x + 1$ $f(-x) = 3(-x) + 1$ $f(-x) = -3x + 1$ $f(-x) \neq f(x)$ and $f(-x) \neq -f(x)$ This function is neither even nor odd

Transforming Functions:

A general form of writing functions is $y = a(b(x - h)) + k$
Each variable is used to transform a function in a different way

a: Vertical stretch/compression by a factor of a
b: Horizontal stretch/compression by a factor of b
h: Horizontal translation by h units
k: Vertical translation by k units

If a is negative, then the graph is reflected vertically
If b is negative, then the graph is reflected horizontally

Several functions use this general format, such as:
Quadratics: $y = a(b(x - h))^2 + k$
Absolute Value: $y = a|b(x - h)| + k$
Radical: $y = a\sqrt{b(x - h)} + k$