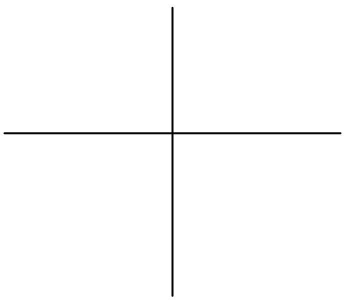
Unit 3: Intervals of Concavity
Points of Inflection

Name:________________________

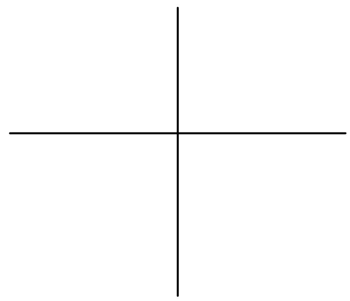
A graph is concave up if it forms a parabola that opens "upward".
This will occur when $f''(x) > 0$ on an interval.

A graph is concave down if it forms a parabola that opens "downward".
This will occur when $f''(x) < 0$ on an interval.

Examples:



Concave Up



Concave Down

What is happening to the slopes in each of these two situations?

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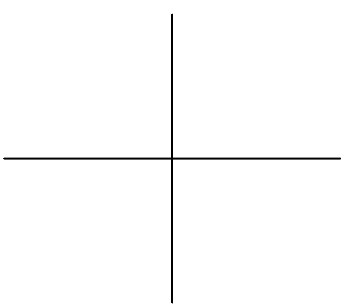
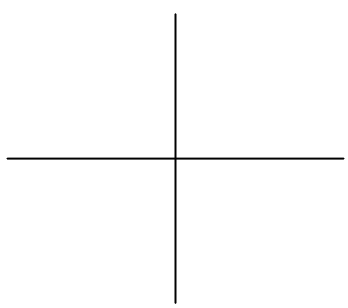
A point of inflection is a point on a continuous graph that switches concavity.

NOTE: When concavity changes due to an infinite discontinuity (VA), a point of inflection does not exist!

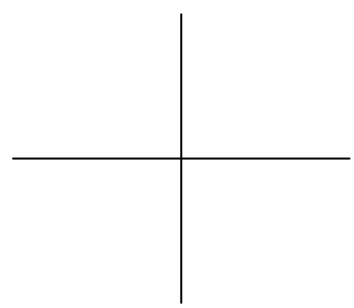
Examples:



Concave Up: $(-1, \infty)$
Concave Down: $(-\infty, -1)$



Concave Up: $(-\infty, -2) \cup (2, \infty)$
Concave Down: $(-2, 2)$



Concave Up: $(-\infty, 0)$
Concave Down: $(0, \infty)$

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Finding Intervals of Concavity

Procedure:

1. Find the second derivative.
2. Find the critical numbers
   - -where $f''(x) = 0$
   - -values of *x* that make $f(x)$ or $f''(x)$ undefined
3. Place those values on a number line.
4. Test a value in each interval in $f''(x)$
   - -concave up where $f''(x)$ is positive
   - -concave down where $f''(x)$ is negative
5. Write the solution using interval notation.
6. Determine if any points of inflection exist and write in point form.

Examples:

1. $f(x) = 2x^3 - 6x^2 + 5x - 4$

Concave Up:

Concave Down: Point(s) of Inflection:

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2. $f(x) = \sqrt[3]{x^2}$

Concave Up:

Concave Down: Point(s) of Inflection: