Before we start 4.3, let us take a look at some questions from 4.2.

54. On what interval is the function $g(x) = e^{x^3 - 6x^2 + 8}$ decreasing?

56. All of the following satisfy the conditions of the Mean Value Theorem on the interval [-1,1] except

A) $\sin x$

B) $\sin^{-1} x$

C) $x^{5/3}$

D) $x^{3/5}$

E) $\frac{x}{x - 2}$

53. If f(x) = cos x, then the Mean Value Theorem guarantees that somewhere between 0 and $\pi/3$, f'(x) =

A) $\frac{-3}{2\pi}$

B) $\frac{-\sqrt{3}}{2}$

C) $\frac{-1}{2}$

D) 0

E) $\frac{1}{2}$

4.3 Connecting f' and f'' with the Graph of f

First Derivative Test

If f'(x) switches from positive to negative at x=c, then a maximum occurs at x=c.

If f'(x) switches from negative to positive at x=c, then a minimum occurs at x=c.

If f'(x) does not switch signs at x=c, then neither a max nor a min occurs at x=c.

Concavity Test

If $f''(x)>0$ for all x on (a,b), then $f(x)$ is concave up on (a,b)

If $f''(x)<0$ for all x on (a,b), then $f(x)$ is concave down on (a,b)

Inflection Points

If $f''(x)$ switches signs at $x=c$, then $x=c$ is an inflection point.

Ex 1) Use $f'(x)$ and $f''(x)$ to determine increasing/decreasing, max/min, concavity, and inflection points.

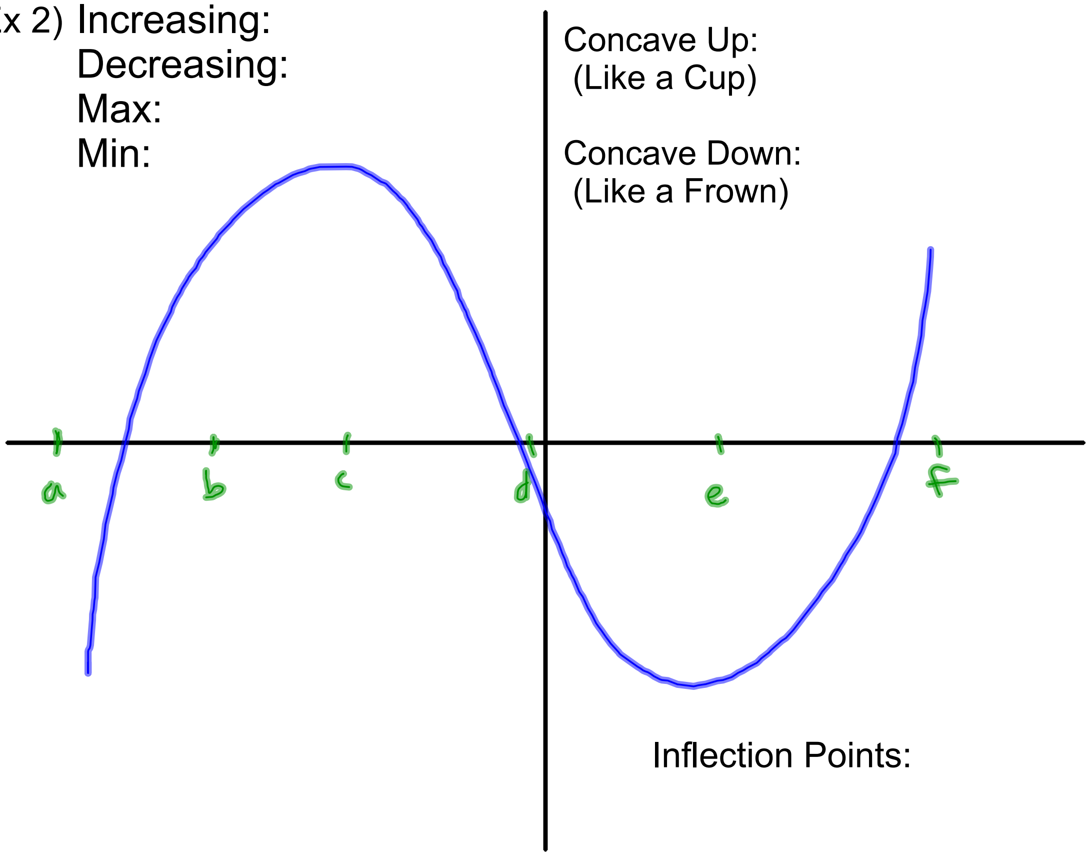
$$f(x) = x^3 - 12x - 5$$

Ex1) Continued.... $f(x) = x^3 - 12x - 5$

Ex 2) Increasing:
Decreasing:
Max:
Min:

Concave Up:
(Like a Cup)

Concave Down:
(Like a Frown)



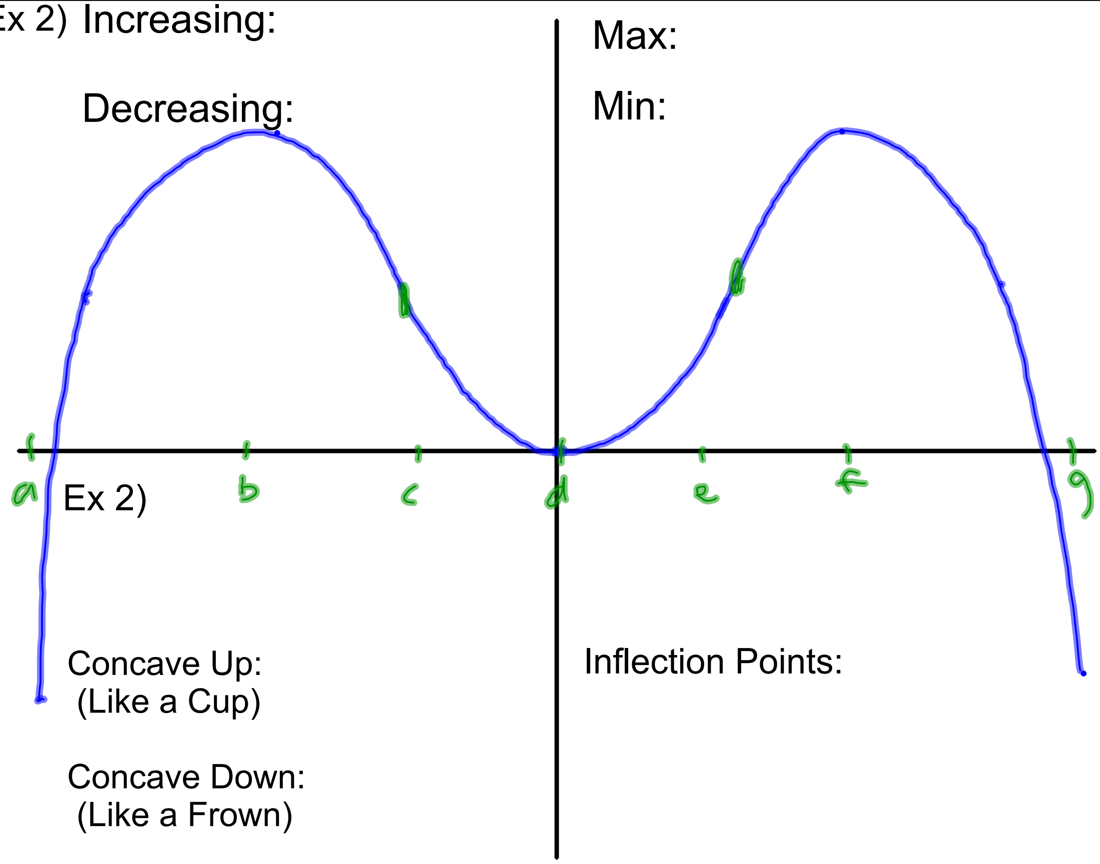
Inflection Points:

Ex 2) Increasing:

Decreasing:

Max:

Min:



Concave Up:
(Like a Cup)

Concave Down:
(Like a Frown)

Inflection Points: