

C12 - 3.2 - Max/Min/Concavity Derivative Tests Review

Find/Label any Max's/Min's/CP's/Inflection Points/IP's and state Intervals of Increase/Decrease/Concavity and Graph.

y' Test

CP: Critical Point

1st Derivative test

$$y = x^3 - 12x$$

$$y' = 3x^2 - 12$$

$$0 = 3x^2 - 12$$

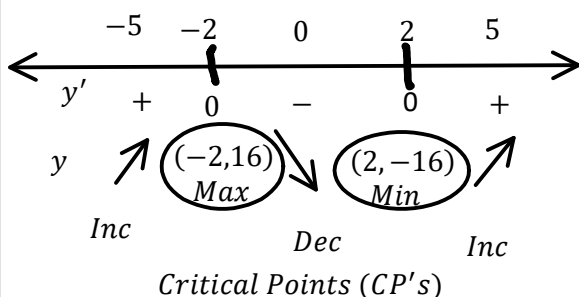
$$3x^2 = 12$$

$$x^2 = 4$$

$$x = \pm 2$$

Find the 1st $\frac{d}{dx}$
Set the $\frac{d}{dx} = 0$

Solve : Critical Values



Prove the 1st derivative is positive to the left of -2. Negative between -2 and 2. And positive to the right of 2.

$$y' = 3x^2 - 12 \quad y' = 3x^2 - 12$$

$$f'(-5) = 3(-5)^2 - 12 \quad f'(5) = 3(5)^2 - 12$$

$$f'(-5) = + \quad f'(5) = +$$

$$y' = 3x^2 - 12$$

$$f'(0) = 3(0)^2 - 12$$

$$f'(0) = -$$

Increasing: $(-\infty, -2) \cup (2, \infty)$

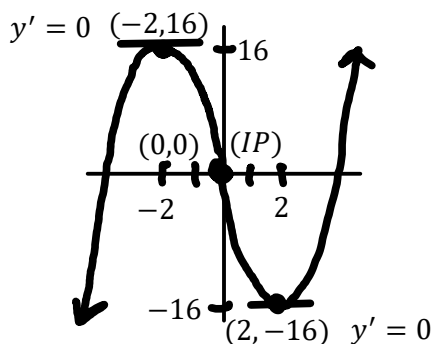
Decreasing: $(-2, 2)$

$$y = x^3 - 12x \quad y = x^3 - 12x$$

$$f(-2) = (-2)^3 - 12(-2) \quad f(2) = (2)^3 - 12(2)$$

$$f(-2) = 16 \quad f(2) = -16$$

Critical Points



y'' Test

IP: Inflection Point

2nd Derivative test

$$y' = 3x^2 - 12$$

$$y'' = 6x$$

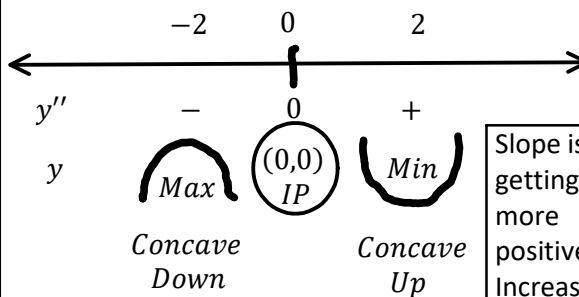
$$0 = 6x$$

$$x = 0$$

Find the 2nd $\frac{d}{dx}$

Set the $\frac{d}{dx} = 0$

Solve : Critical Values



Slope is getting more positive. Increasing*.

Prove 2nd derivative is negative to the left of 0 and positive to the right of 0.

$$y'' = 6x \quad y'' = 6x$$

$$f''(-1) = 6(-1) \quad f''(-1) = 6(-1)$$

$$f''(-1) = - \quad f''(-1) = -$$

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

Concave Up: $(0, \infty)$

$$y = x^3 - 12x$$

$$y = (0)^3 - 12(0)$$

$$y = 0$$

Inflection Point

