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

$y = x^3 - 12x$ Find the 1st $\frac{d}{dx}$

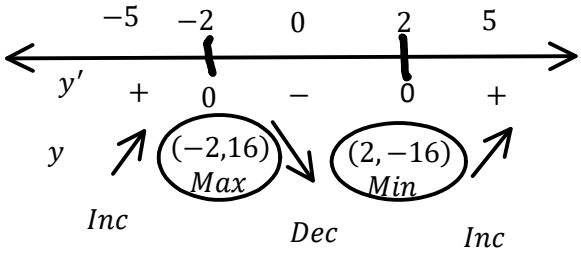
$y' = 3x^2 - 12$

$0 = 3x^2 - 12$ Set the $\frac{d}{dx} = 0$

$3x^2 = 12$

$x^2 = 4$

$x = \pm 2$ Solve : Critical Values



Critical Points $(CP's)$

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

$y' = 3x^2 - 12$

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

$f'(-5) = +$

$y' = 3x^2 - 12$

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

$f'(5) = +$

$y' = 3x^2 - 12$

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

$f'(0) = -$

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

Decreasing: $(-2,2)$

$y = x^3 - 12x$

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

$f(-2) = 16$

$y = x^3 - 12x$

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

$f(2) = -16$

Critical Points

y'' Test

IP: *Inflection Point*

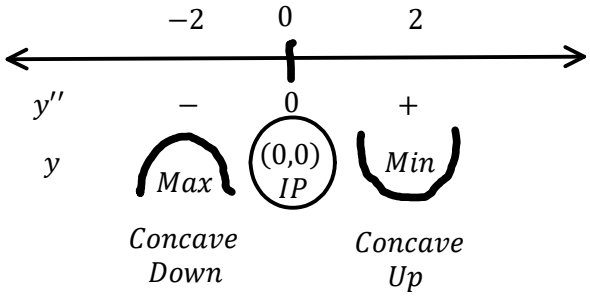
2nd Derivative test

$y' = 3x^2 - 12$ Find the 2nd $\frac{d}{dx}$

$y'' = 6x$

$0 = 6x$ Set the $\frac{d}{dx} = 0$

$x = 0$ Solve : Critical Values



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

$y'' = 6x$

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

$f''(-1) = -$

$y'' = 6x$

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

$f''(-1) = +$

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

Concave Up: $(0, \infty)$

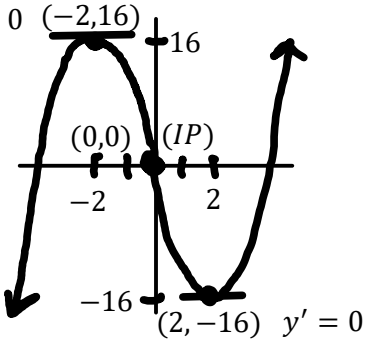
$y = x^3 - 12x$

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

$y = 0$

Inflection Point

$y' = 0$ $(-2,16)$



$y' = 0$