

# C12 - 3.3 - Poly Max/Min/Concavity Graphing

$$y = x^3 + 12x^2 + 36x$$

$$y' = 3x^2 + 24x + 36$$

$$0 = x^2 + 8x + 12$$

$$0 = (x + 6)(x + 2)$$

$$x = -6, -2$$

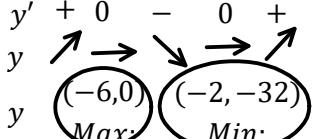
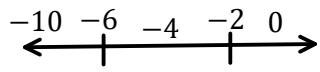
Sign Analysis

$$y' = (x + 6)(x + 2)$$

$$y'(-10) = (-)(-) = +$$

$$y'(-4) = (+)(-) = -$$

$$y'(0) = (+)(+) = +$$



Domain:  $x \in \mathbb{R}$  Range:  $y \in \mathbb{R}$

Critical Points (CP):

$$y = x^3 + 12x^2 + 36x$$

$$y = (-6)^3 + 12(-6)^2 + 36(-6)$$

$$y = 0$$

$$y = x^3 + 12x^2 + 36x$$

$$y = (-2)^3 + 12(-2)^2 + 36(-2)$$

$$y = -32$$

Intervals of Inc/Dec

Increasing:  $(-\infty, -6), (-2, \infty)$

Decreasing:  $(-6, -2)$

$$y'' = 6x + 24$$

$$0 = 6(x + 4)$$

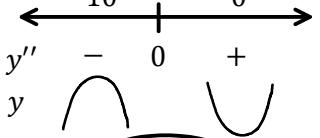
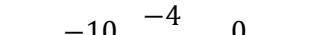
$$x = -4$$

Sign Analysis

$$y'' = 6(x + 4)$$

$$y''(-10) = +(-) = -$$

$$y''(0) = +(+) = +$$



Inflection Point (IP):

$$y = x^3 + 12x^2 + 36x$$

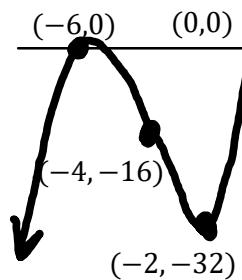
$$y = (-4)^3 + 12(-4)^2 + 36(-4)$$

$$y = -16$$

Concave Up:  $(-4, \infty)$

Concave Down:  $(-\infty, -4)$

Number Lines &  
Graph Lines Up.



$y$  - intercepts

$$y = x^3 + 12x^2 + 36x$$

$$y = (0)^3 + 12(0)^2 + 36(0)$$

$$y = 0$$

$x$  - intercepts

$$y = x^3 + 12x^2 + 36x$$

$$0 = x^3 + 12x^2 + 36x$$

$$0 = x(x^2 + 12x + 36)$$

$$0 = x(x + 6)(x + 6)$$

$$x = 0, -6$$

