

Polynomial Graph

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$$y = x^3 - 3x^2 + 3 \quad D: (-\infty, \infty)$$

$$y' = 3x^2 - 6x = 0 \quad 3x(x-2) = 0$$

$$x = 0 \quad x = 2$$

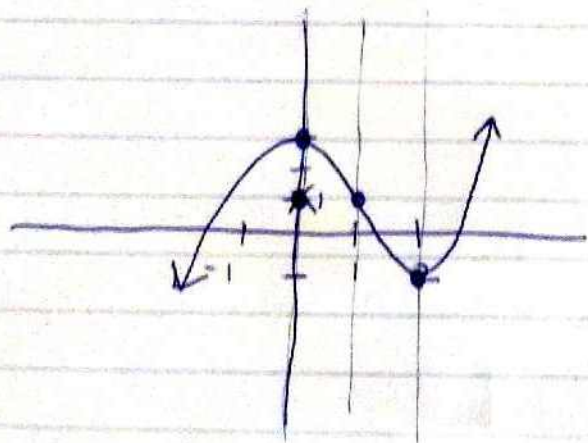
max
(0, 3)
min
(2, -1)

$(-\infty, 0)$	$(0, 2)$	$(2, \infty)$
$f'(-1) > 0$ incr	$f'(1) < 0$ decr	$f'(3) > 0$ incr

$$y'' = 6x - 6 = 0 \quad x = 1$$

$(-\infty, 1)$	$(1, \infty)$
$f''(0) < 0$ down	$f''(2) > 0$ up

POI
(1, 1)



Rational Graph

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$$y = \frac{x^2 + 1}{x^2 - 9} \quad D: (-\infty, -3) \cup (-3, 3) \cup (3, \infty)$$

$$y' = \frac{2x(x^2 - 9) - 2x(x^2 + 1)}{(x^2 - 9)^2} = \frac{-20x}{(x^2 - 9)^2} = 0$$

$$x = 0$$

Max
(0, 1/9)

$(-\infty, -3)$	$(-3, 0)$	$(0, 3)$	$(3, \infty)$
$f'(-4) > 0$ incr	$f'(-1) > 0$ incr	$f'(1) < 0$ decr	$f'(4) < 0$ decr

$$f''(x) = \frac{-20(x^2 - 9)^2 - 2(x^2 - 9)(2x)(-20x)}{(x^2 - 9)^4}$$

$$= \frac{-20(x^2 - 9)[x^2 - 9 - 4x^2]}{(x^2 - 9)^4} = \frac{-20(-3x^2 - 9)}{(x^2 - 9)^3}$$

no solution

no
POI

$(-\infty, -3)$	$(-3, 3)$	$(3, \infty)$
$f''(-4) > 0$ up	$f''(0) < 0$ down	$f''(4) > 0$ up

HA: $y = 1$

