

## Day 3: 3.2 - Reciprocal of a Quadratic Function

EX 2 - Graphing a reciprocal of a quadratic function with one zero:  $f(x) = \frac{1}{x^2 - 6x + 9} = \frac{1}{(x-3)^2}$

VA:  $x=3$

$x \rightarrow 3^+$   $y \rightarrow +\infty$

$x \rightarrow 3^-$   $y \rightarrow +\infty$

HA:  $y=0$

$x \rightarrow \infty$   $y \rightarrow 0^+$

$x \rightarrow -\infty$   $y \rightarrow 0^+$

x-int: set  $y=0$

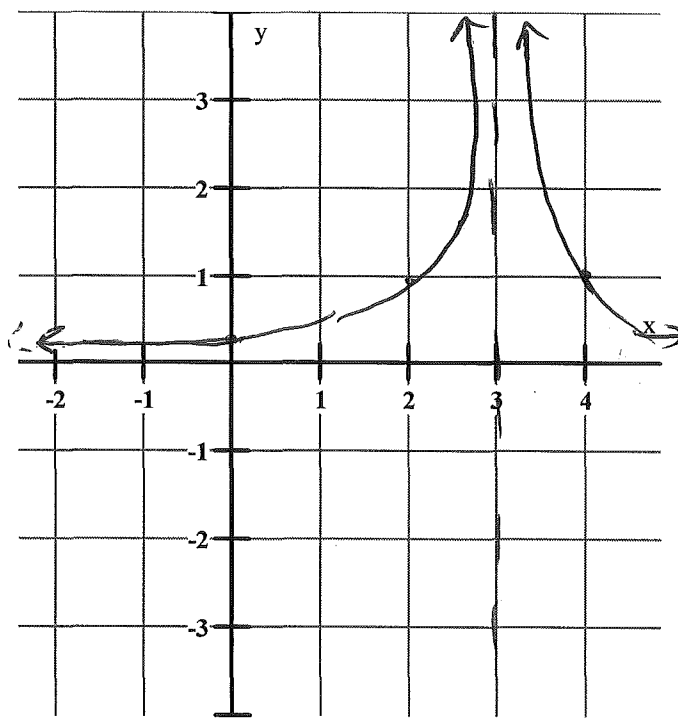
$$0 = \frac{1}{(x-3)^2}$$

NO SOL<sup>n</sup>

y-int: set  $x=0$

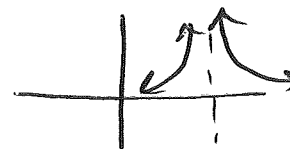
$$y = \frac{1}{(0-3)^2} = \frac{1}{9}$$

	$(-\infty, 3)$	$(3, \infty)$
$f(x)$	+	+



Domain:  $x \in (-\infty, 3) \cup (3, \infty)$

Range:  $y \in (0, \infty)$



EX 3 - Graphing a reciprocal of a quadratic function with no zeros:  $f(x) = \frac{1}{x^2 + 2}$

VA: set denominator = 0

$$x^2 + 2 = 0$$

$$x^2 = -2$$

NO SOL<sup>n</sup>

HA:  $y = 0$

$$x \rightarrow \infty \quad y \rightarrow 0^+$$

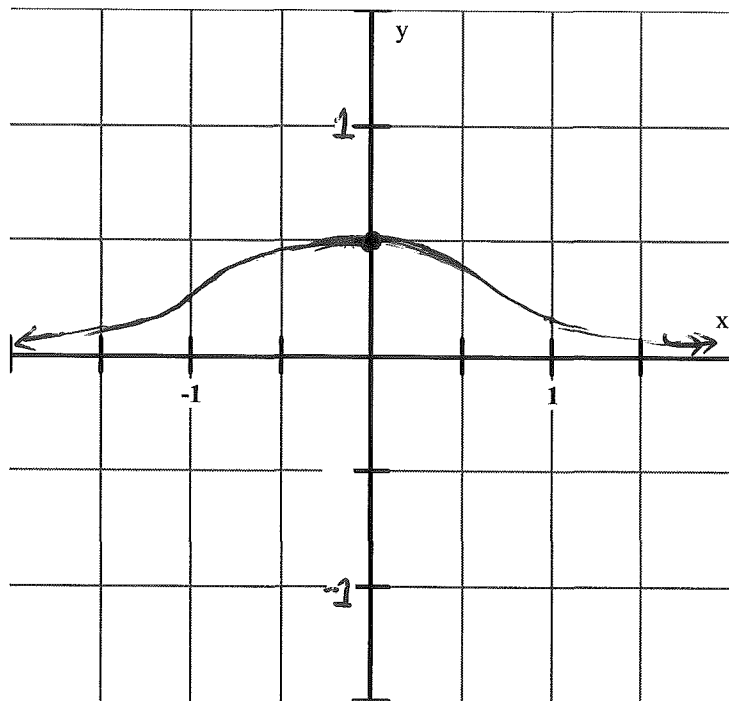
$$x \rightarrow -\infty \quad y \rightarrow 0^+$$

x-int: set  $y = 0$

$$0 = \frac{1}{x^2 + 2} \quad \text{NO SOL<sup>n</sup>}$$

y-int: set  $x = 0$

$$y = \frac{1}{0^2 + 2} = \frac{1}{2}$$



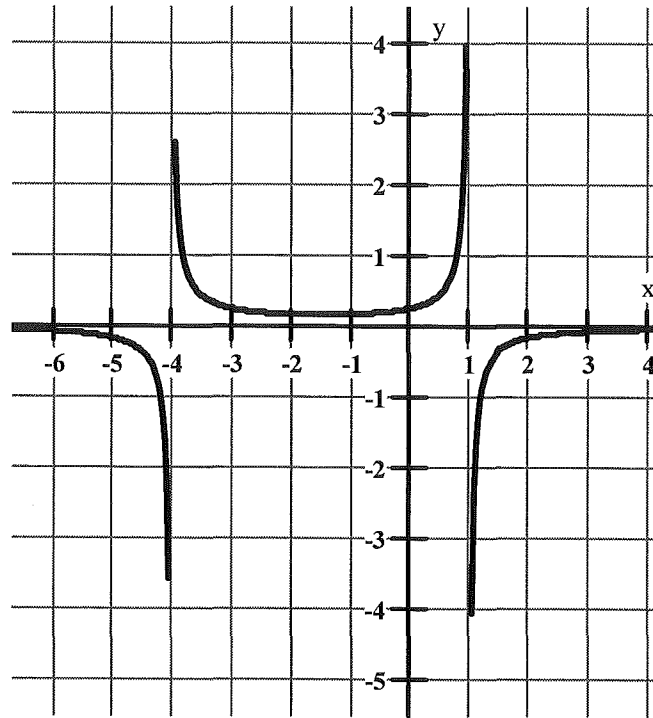
Domain:  $x \in (-\infty, \infty)$  OR  $\{x \in \mathbb{R}\}$

Range:  $y \in (0, 0.5]$  OR  $\{y \in \mathbb{R} \mid 0 < y \leq 0.5\}$

### Intervals of Increase/Decrease

EX 4 - For the following function, describe the intervals where the slope is increasing and slope is decreasing. Include the sign of the slope (positive or negative).

\* The intervals are based on the vertical asymptote and any local maximum/minimum



Interval	Change in Slope	Sign of Slope
$x \in (-\infty, -4)$	decreasing	-
$x \in (-4, -1.5)$	increasing	-
$x \in (-1.5, 1)$	increasing	+
$x \in (1, \infty)$	decreasing	+