

C11 - 7.8 - Quadratic Reciprocals Notes

$$y = x^2 - 4$$

Parabola

$$y = \frac{1}{x^2 - 4}$$

Reciprocal Parabola

Solve algebraically: set denominator = 0, 1, -1.

Vertical asymptote (VA):

Denominator = 0

$$\begin{aligned} x^2 - 4 &= 0 \\ (x + 2)(x - 2) &= 0 \end{aligned}$$

$$x = 2, -2$$

$$\begin{aligned} \text{VA's: } x &= 2 \\ x &= -2 \end{aligned}$$

Invariant points (IP):

Denominator = 1

$$\begin{aligned} x^2 - 4 &= 1 \\ x^2 &= 5 \\ x &= \sqrt{5}, -\sqrt{5} \end{aligned}$$

$$\begin{aligned} (\sqrt{5}, 1) \\ (-\sqrt{5}, 1) \end{aligned}$$

Invariant points (IP):

Denominator = -1

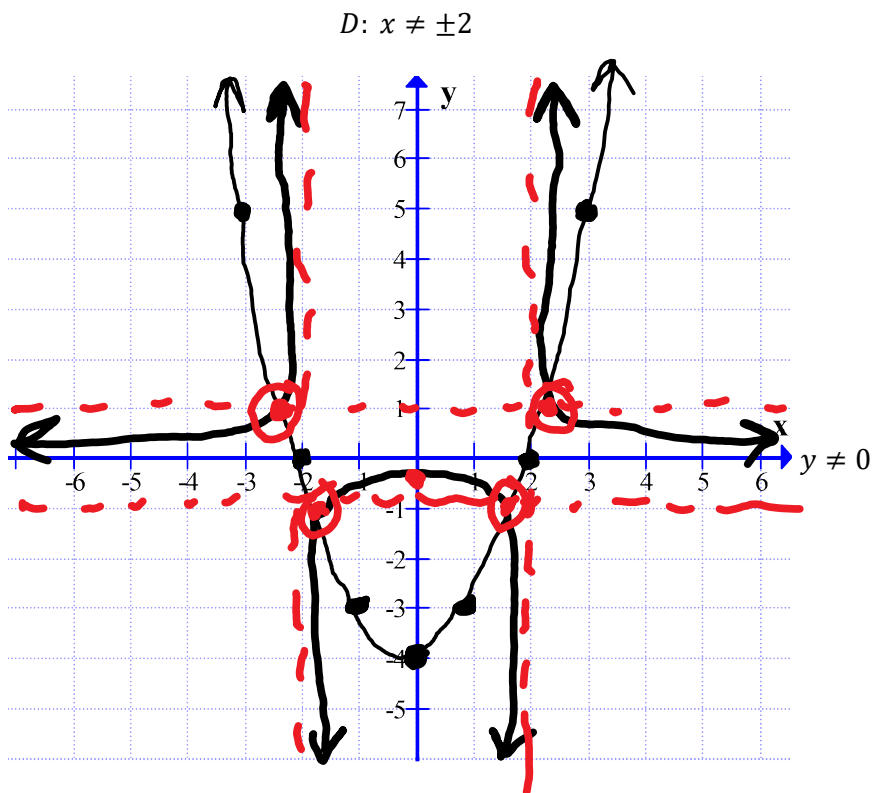
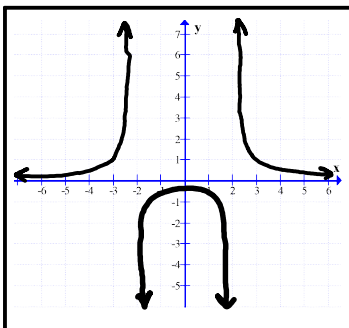
$$\begin{aligned} x^2 - 4 &= -1 \\ x^2 &= 3 \\ x &= \sqrt{3}, -\sqrt{3} \end{aligned}$$

$$\begin{aligned} (\sqrt{3}, -1) \\ (-\sqrt{3}, -1) \end{aligned}$$

Solve graphically.

$$\begin{aligned} y &= x^2 - 4 \\ y &= \frac{1}{x^2 - 4} \end{aligned}$$

1. Graph original
2. Graph VA's: Dotted lines
3. Graph IP's
4. Graph reciprocal
5. y-int



$$(0, -4) \longrightarrow \left(0, -\frac{1}{4}\right) \quad \frac{1}{y} \quad \frac{1}{-\frac{1}{4}}$$