

# Rational Polynomials: Graphing and Asymptotes

Find the intercepts, if there are any.

**Step 1:** Set the numerator to 0 to solve for horizontal intercepts.

**Step 2:** Set the x to 0 to solve for vertical intercept.

**Step 3:** Set the denominator to 0 to solve for vertical asymptotes.

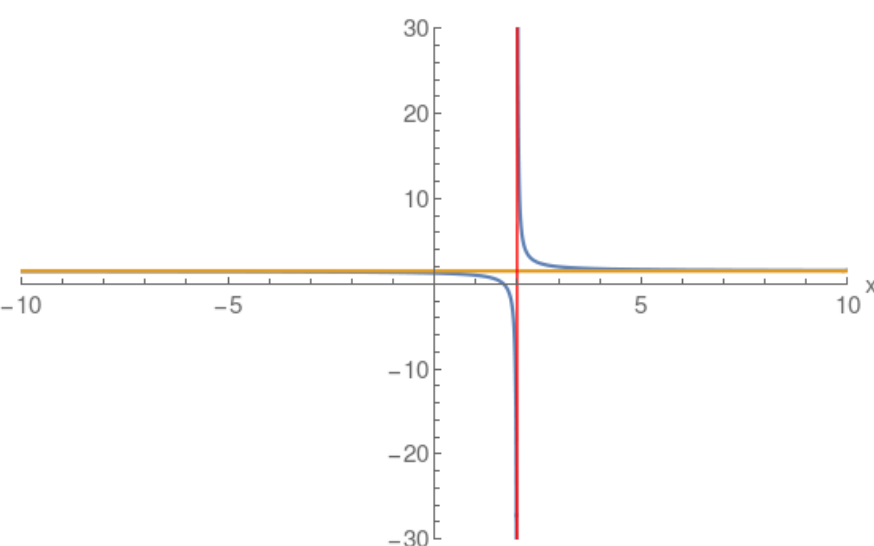
**Step 4:** Perform a long division to find the quotient which specifies the oblique asymptote.

**Note:** Blue curve the actual Rational function.  
Red and Gold asymptotes.

## Example: Horizontal Asymptote

$$\frac{3x-5}{2x-4}$$

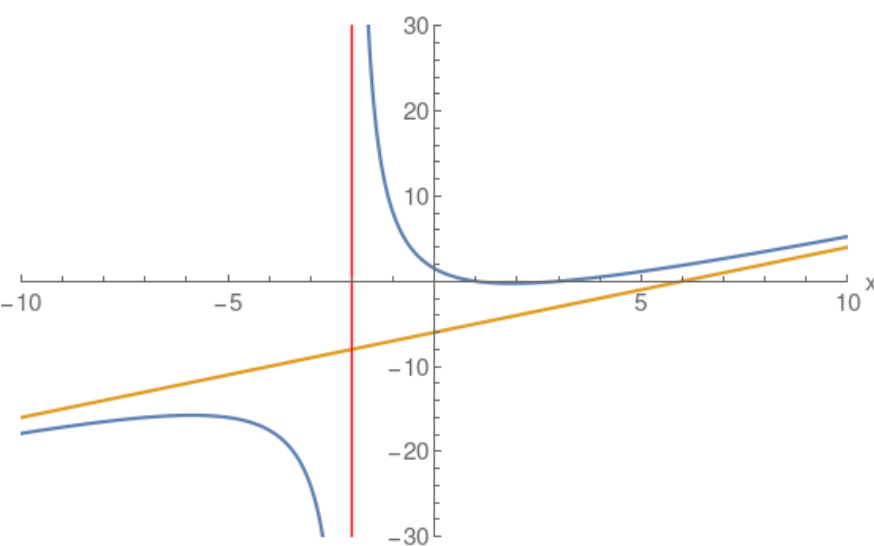
$$\begin{array}{r} \phantom{2x-4} + \left( \frac{3}{2} \right) \\ \hline \boxed{2x-4} \quad (3)x \quad + (-5) \\ \phantom{2x-4} \quad \left( \frac{3}{2} \right) (2x-4) \\ \phantom{2x-4} \quad \left( \frac{3}{2} \right) (2x) + \left( \frac{3}{2} \right) (-4) \\ \phantom{2x-4} \quad \left( \frac{3}{2} \right) (2x) + \left( \frac{3}{2} \right) (-4) \\ \phantom{2x-4} \quad \left( \frac{3}{2} \right) (2x) + \left( \frac{3}{2} \right) (-4) \\ \phantom{2x-4} \quad \left( \frac{3}{2} \right) (2x) + \left( \frac{3}{2} \right) (-4) \end{array}$$



## Example: Oblique Linear Asymptote

$$\frac{(x-3)(x-1)}{x+2}$$

$$\begin{array}{r} \phantom{x+2} + \left( x \right) \quad + \left( -6 \right) \\ \hline \boxed{x+2} \quad (1)x^2 + (-4)x + (3) \\ \phantom{x+2} \quad \left( x \right) (x+2) \\ \phantom{x+2} \quad \left( x \right) (x) + \left( x \right) (2) \\ \phantom{x+2} \quad \left( x \right) (x) + \left( x \right) (2) \\ \phantom{x+2} \quad \left( x \right) (x) + \left( x \right) (2) \\ \phantom{x+2} \quad \left( x \right) (x) + \left( x \right) (2) \end{array}$$



## Example: Multiple Vertical Asymptotes

$$\frac{x}{(x-1)(x+1)} + \left( 0 \right)$$

