

# 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.

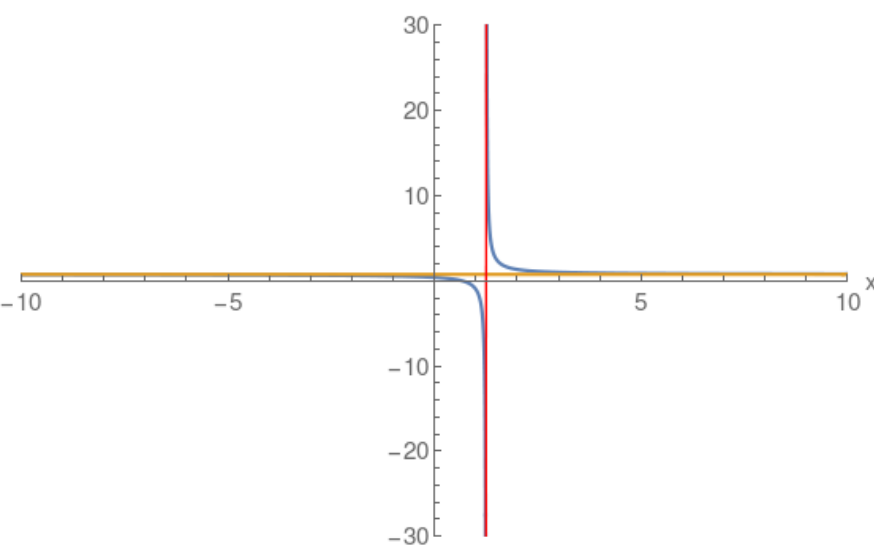
**Step 4:** Perform a long division to find the quotient which specifies the oblique asymptote.

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

## Example: Horizontal Asymptote

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

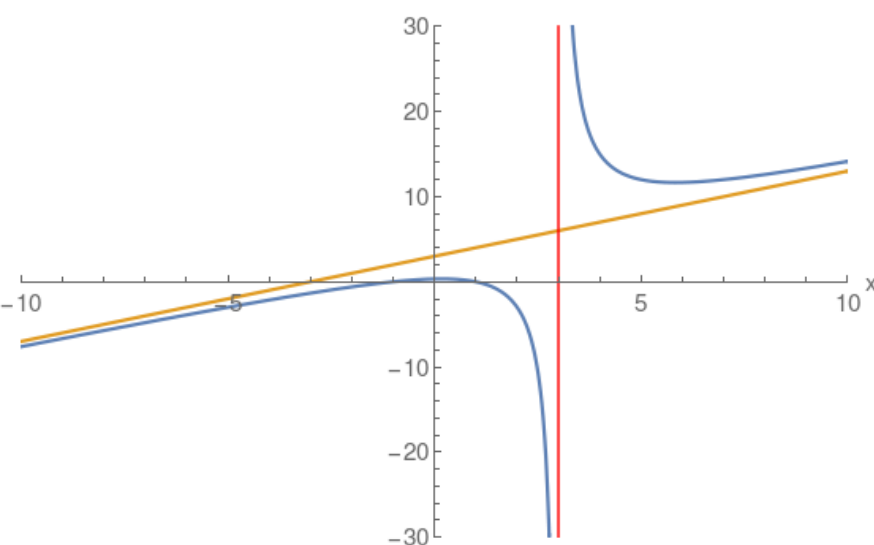
$$\begin{array}{r} \phantom{4x-5} + \left(\frac{3}{4}\right) \\ \hline 4x-5 \quad (3)x \quad + (-2) \\ \phantom{4x-5} \quad (3x) \quad + \left(-\frac{15}{4}\right) \\ \phantom{4x-5} \phantom{(3x)} \quad + \left(\frac{7}{4}\right) \end{array}$$



## Example: Oblique Linear Asymptote

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

$$\begin{array}{r} \phantom{x-3} + \left(x\right) \quad + \left(3\right) \\ \hline x-3 \quad (1)x^2 \quad + (-1) \\ \phantom{x-3} \quad (x^2) \quad + \left(-3x\right) \\ \phantom{x-3} \quad + (3)x \quad + (-1) \\ \phantom{x-3} \quad + (3x) \quad + \left(-9\right) \\ \phantom{x-3} \phantom{(3x)} \quad + \left(8\right) \end{array}$$



## Example: Multiple Vertical Asymptotes

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

$$\begin{array}{r} \phantom{(x-1)(x+1)} + \left(0\right) \\ \hline (x) \end{array}$$

