

# 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.

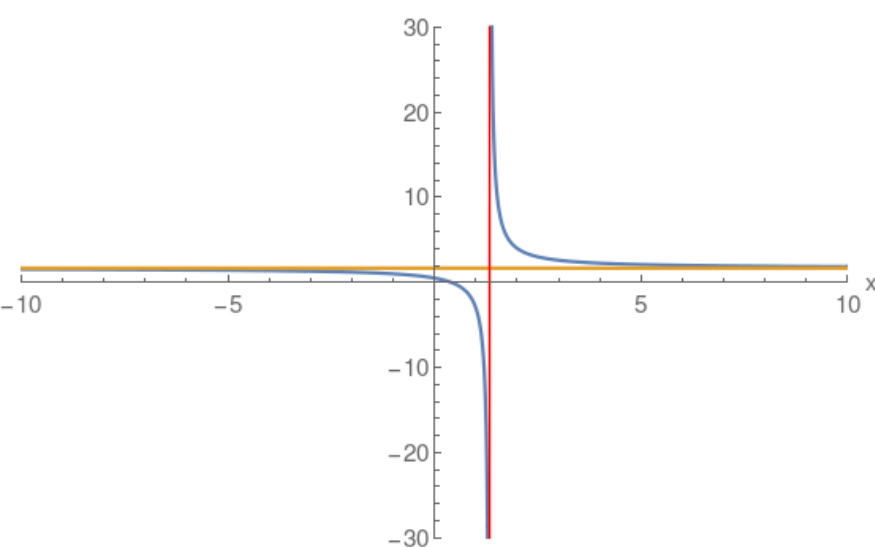
**Step 4:** Perform a long division to find the quotient which specifies the oblique asymptote.

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

## Example: Horizontal Asymptote

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

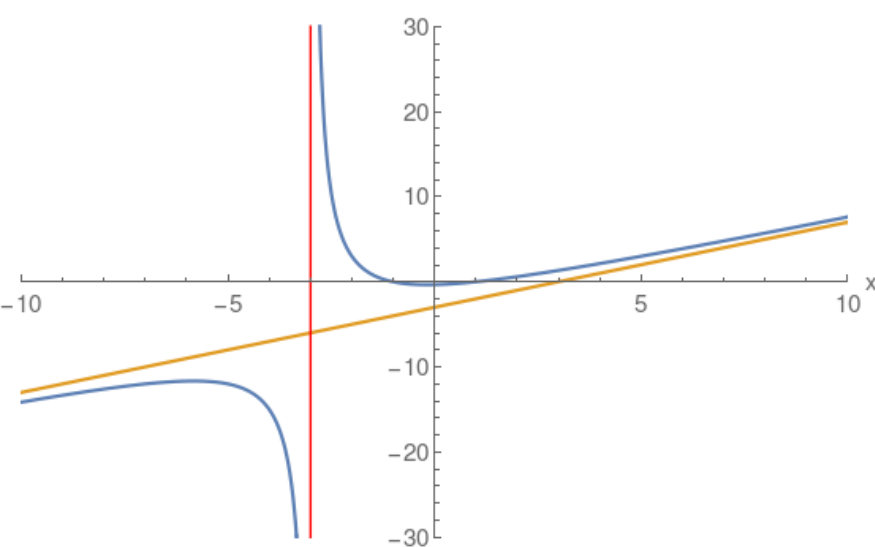
$$\begin{array}{r} \phantom{3x-4} + \left(\frac{5}{3}\right) \\ \hline 3x-4 \quad (5)x \quad + (-2) \\ \phantom{3x-4} \quad (5x) \quad + \left(-\frac{20}{3}\right) \\ \phantom{3x-4} \phantom{(5x)} \quad + \left(\frac{14}{3}\right) \end{array}$$



## Example: Oblique Linear Asymptote

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

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



## Example: Multiple Vertical Asymptotes

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

$$\begin{array}{r} \phantom{(x-2)(x+2)} + \left(0\right) \\ \hline (x) \quad + \left(3\right) \end{array}$$

