

# 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.

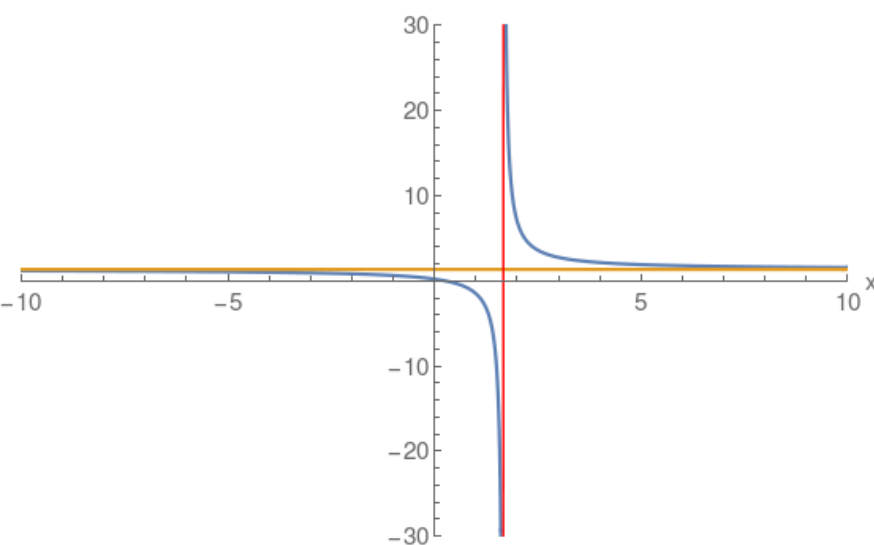
**Step 4:** Perform a long division to find the quotient which specifies the oblique asymptote.

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

## Example: Horizontal Asymptote

$$\frac{4x-1}{3x-5}$$

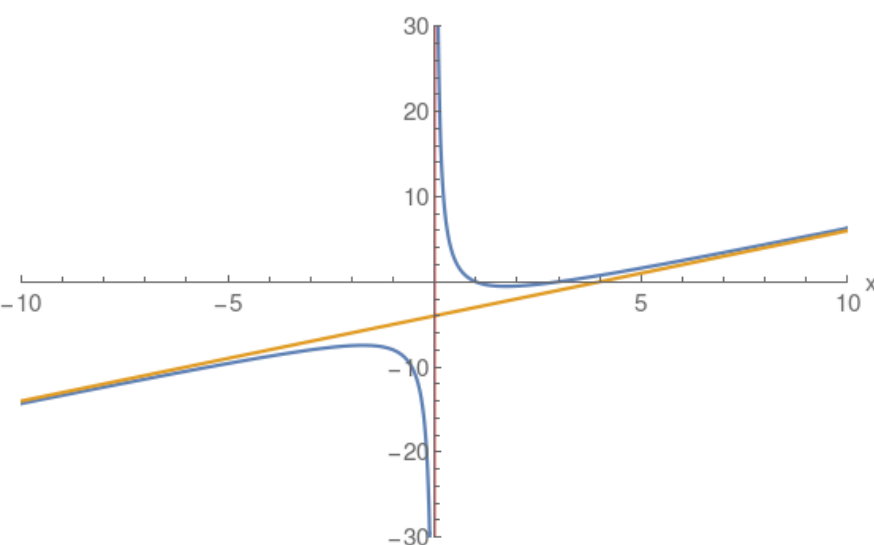
$$\begin{array}{r} \phantom{3x-5} + \left(\frac{4}{3}\right) \\ \hline 3x-5 \quad (4)x \quad + (-1) \\ \phantom{3x-5} (4x) \quad + \left(-\frac{20}{3}\right) \\ \phantom{3x-5} \phantom{(4x)} + \left(\frac{17}{3}\right) \end{array}$$



## Example: Oblique Linear Asymptote

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

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



## Example: Multiple Vertical Asymptotes

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

$$\begin{array}{r} \phantom{x} + (0) \\ \hline (x) \end{array}$$

