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.

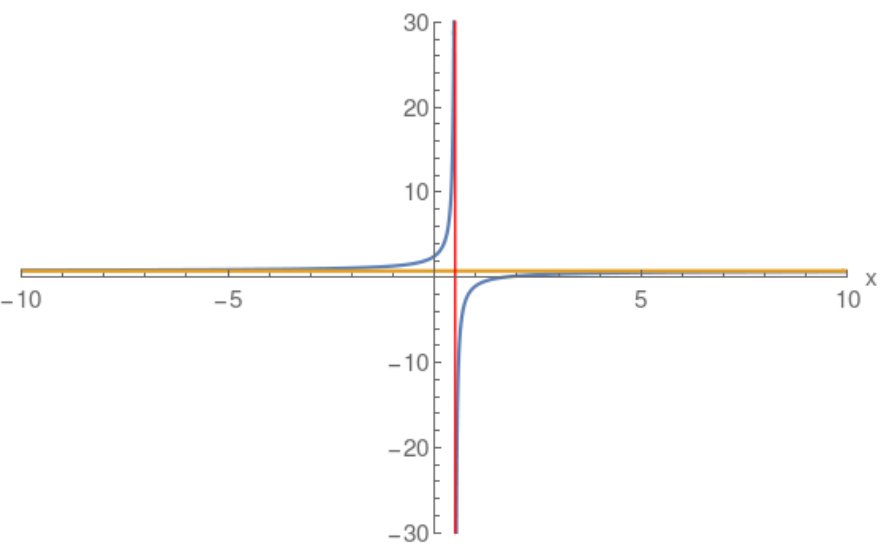
Step 4: Perform a long division to find the quotient which specifies the oblique asymptote.

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

Example: Horizontal Asymptote

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

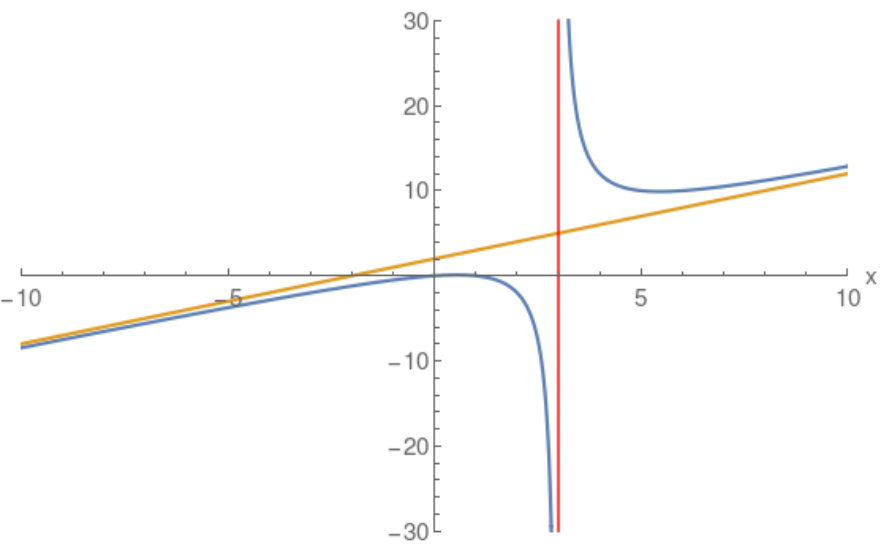
$$\begin{array}{r|l} & +\left(\boxed{\frac{3}{4}}\right) \\ \hline \boxed{4x-2} & (3)\,x \quad +(-5) \\ & \left(\boxed{3x}\right) \quad +\left(\boxed{-\frac{3}{2}}\right) \\ & +\left(\boxed{-\frac{7}{2}}\right) \end{array}$$



Example: Oblique Linear Asymptote

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

$$\begin{array}{r|l} & +\left(\boxed{x}\right) \quad +\left(\boxed{2}\right) \\ \hline \boxed{x-3} & (1)\,x^2 \quad +(-1)\,x \\ & \left(\boxed{x^2}\right) \quad +\left(\boxed{-3x}\right) \\ & +(2)\,x \\ & +\left(\boxed{2x}\right) \quad +\left(\boxed{-6}\right) \\ & +\left(\boxed{6}\right) \end{array}$$



Example: Multiple Vertical Asymptotes

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

$$\begin{array}{r|l} & +\left(\boxed{0}\right) \\ \hline \left(\boxed{x}\right) & +\left(\boxed{3}\right) \end{array}$$