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.

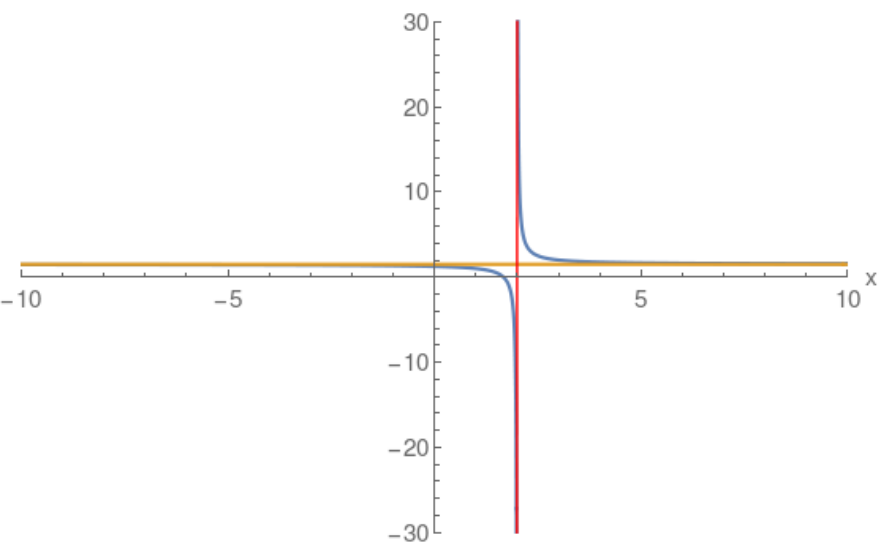
Step 4: Perform a long division to find the quotient which specifies the oblique asymptote.

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

Example: Horizontal Asymptote

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

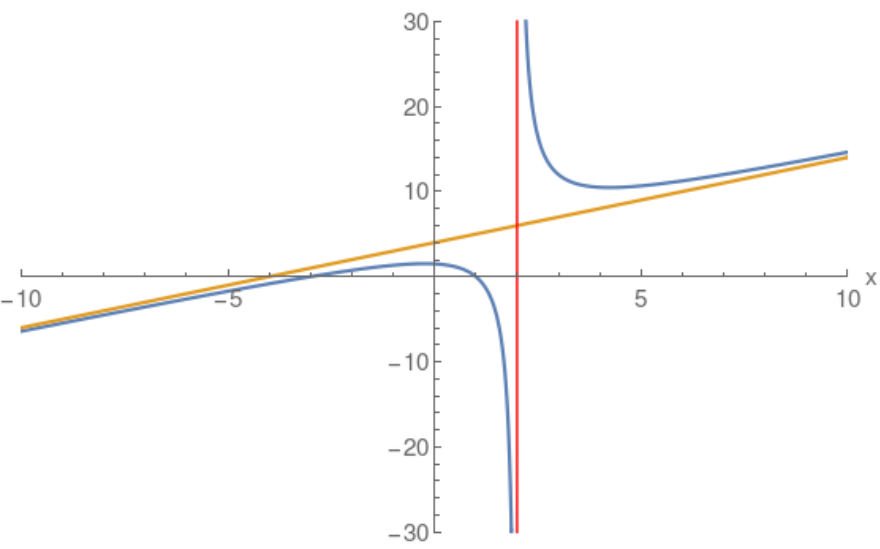
$$\begin{array}{r|l} & +\left(\boxed{\frac{3}{2}}\right) \\ \hline \boxed{2x-4} & (3)\,x \quad +(-5) \\ & \left(\boxed{3x}\right) \quad +\left(\boxed{-6}\right) \\ & +\left(\boxed{1}\right) \end{array}$$



Example: Oblique Linear Asymptote

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

$$\begin{array}{r|ll} & +\left(\boxed{x}\right) & +\left(\boxed{4}\right) \\ \hline \boxed{x-2} & (1)\,x^2 \quad +(2)\,x & +(-3) \\ & \left(\boxed{x^2}\right) \quad +\left(\boxed{-2x}\right) & \\ & +(4)\,x & +(-3) \\ & +\left(\boxed{4x}\right) & +\left(\boxed{-8}\right) \\ & & +\left(\boxed{5}\right) \end{array}$$



Example: Multiple Vertical Asymptotes

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

$$\begin{array}{r|l} & +\left(\boxed{0}\right) \\ \hline \left(\boxed{x}\right) & +\left(\boxed{2}\right) \end{array}$$