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.

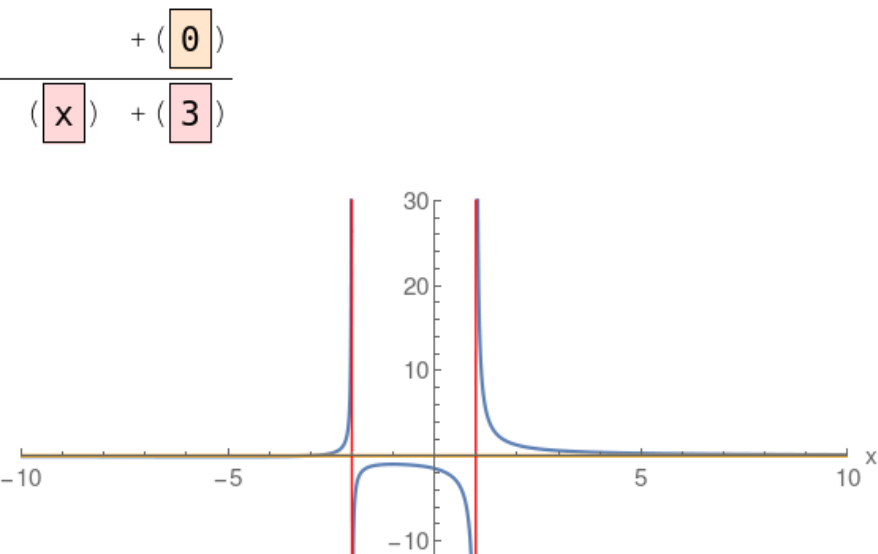
Step 4: Perform a long division to find the quotient which specifies the oblique asymptote.

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

Example: Horizontal Asymptote

$$\frac{5x-3}{2x-1}$$

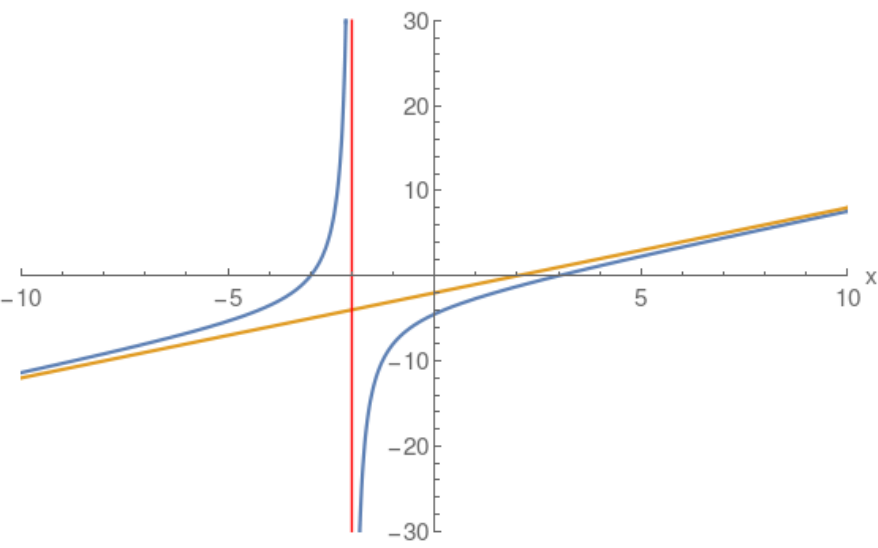
$$\begin{array}{l|ll} & & +\left(\frac{5}{2}\right) \\ \hline 2x-1 & (5)\,x & +(-3) \\ & \left(5x\right) & +\left(-\frac{5}{2}\right) \\ & & +\left(-\frac{1}{2}\right) \end{array}$$



Example: Oblique Linear Asymptote

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

$$\begin{array}{l|ll} & & +(\boxed{x}) \qquad +(\boxed{-2}) \\ \hline x+2 & (1)\,x^2 & +(-9) \\ & \left(x^2\right) & +\left(2x\right) \\ & & +(-2)\,x \qquad +(-9) \\ & & +\left(-2x\right) \qquad +\left(-4\right) \\ & & +(\boxed{-5}) \end{array}$$



Example: Multiple Vertical Asymptotes

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

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