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.

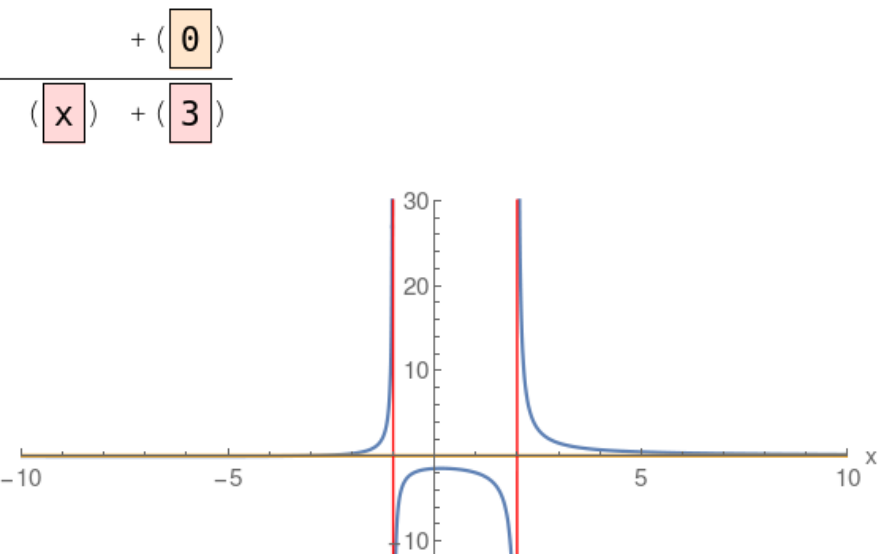
Step 4: Perform a long division to find the quotient which specifies the oblique asymptote.

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

Example: Horizontal Asymptote

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

$$\begin{array}{r|ll} & & +\left(\frac{5}{3}\right) \\ \hline 3x-4 & (5)\,x & +(-2) \\ & \left(5x\right) & +\left(-\frac{20}{3}\right) \\ & & +\left(\frac{14}{3}\right) \end{array}$$



Example: Oblique Linear Asymptote

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

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

Example: Multiple Vertical Asymptotes

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

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