

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.

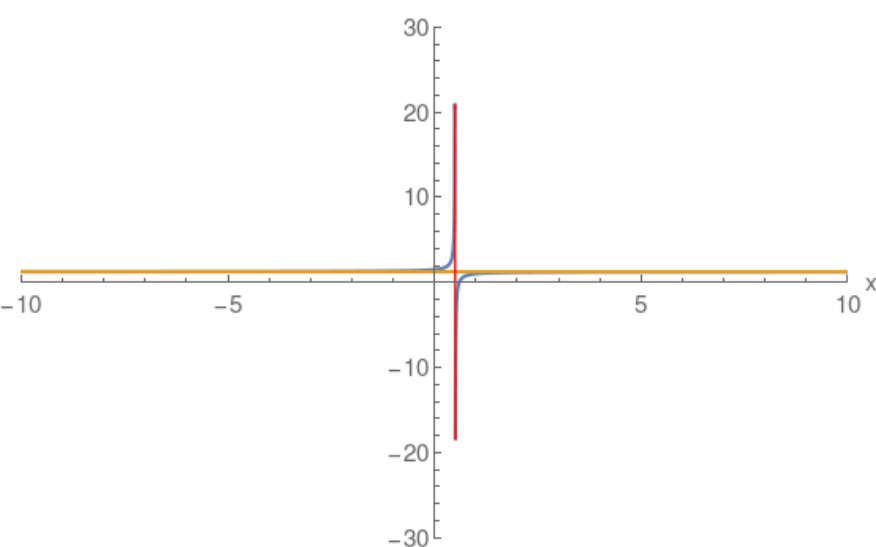
Step 4: Perform a long division to find the quotient which specifies the oblique asymptote.

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

Example: Horizontal Asymptote

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

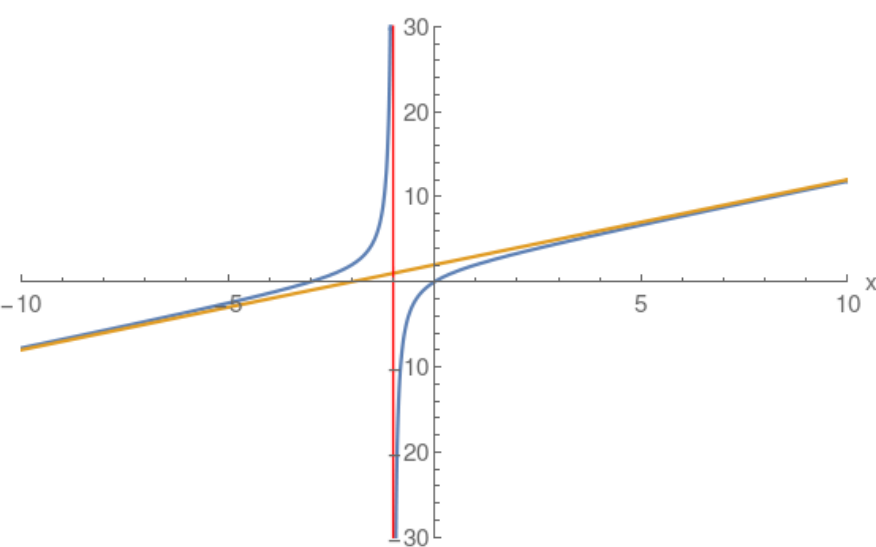
$$\begin{array}{r} + \left(\frac{5}{4} \right) \\ \hline \boxed{4x-2} \quad (5)x + (-3) \\ \quad \left(\frac{5x}{1} \right) + \left(\frac{-\frac{5}{2}}{1} \right) \\ \quad + \left(\frac{-\frac{1}{2}}{1} \right) \end{array}$$



Example: Oblique Linear Asymptote

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

$$\begin{array}{r} + \left(x \right) + \left(2 \right) \\ \hline \boxed{x+1} \quad (1)x^2 + (3)x \\ \quad \left(\frac{x^2}{1} \right) + \left(\frac{x}{1} \right) \\ \quad + (2)x \\ \quad + \left(\frac{2x}{1} \right) + \left(\frac{2}{1} \right) \\ \quad + \left(\frac{-2}{1} \right) \end{array}$$



Example: Multiple Vertical Asymptotes

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

$$\begin{array}{r} + \left(0 \right) \\ \hline \left(\frac{x}{1} \right) + \left(\frac{1}{1} \right) \end{array}$$

