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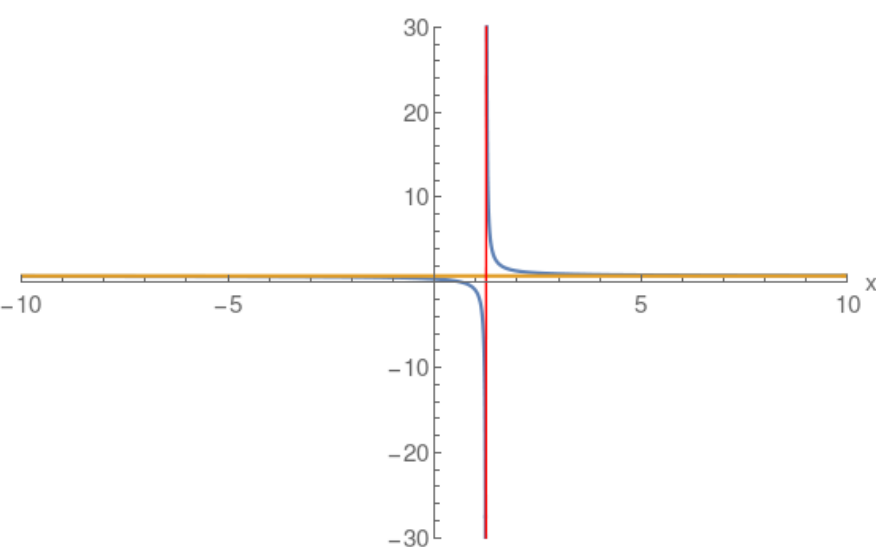**Step 4:** Perform a long division to find the quotient which specifies the oblique asymptote.

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

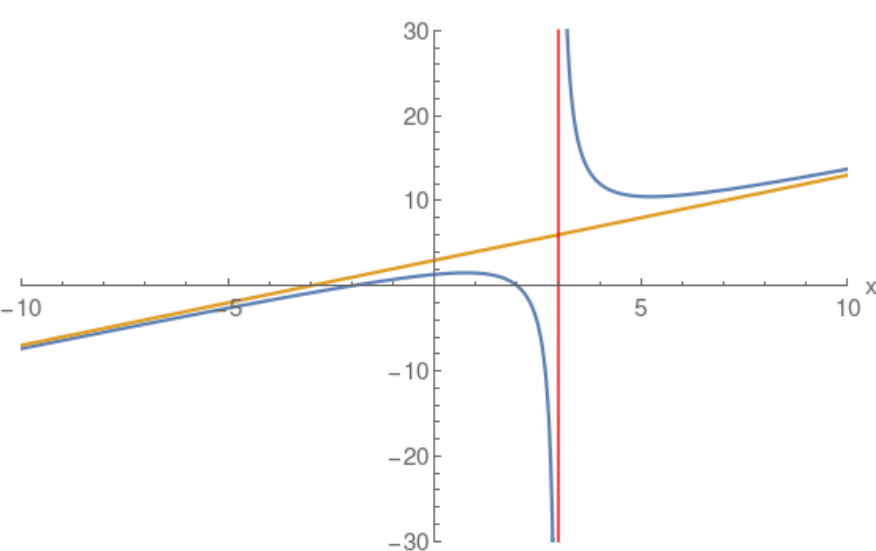## Example: Horizontal Asymptote

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

$$\begin{array}{r} + \left(\boxed{\tfrac{3}{4}}\right) \\ \hline \boxed{4x-5} \quad (3)x \quad + (-2) \\ \left(\boxed{3x}\right) \quad + \left(\boxed{-\tfrac{15}{4}}\right) \\ + \left(\boxed{\tfrac{7}{4}}\right) \end{array}$$

Example: Oblique Linear Asymptote

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

$$\begin{array}{r} + \left(\boxed{x}\right) \quad + \left(\boxed{3}\right) \\ \hline \boxed{x-3} \quad (1)x^2 \quad + (-4) \\ \left(\boxed{x^2}\right) + \left(\boxed{-3x}\right) \\ + (3)x \quad + (-4) \\ + \left(\boxed{3x}\right) \quad + \left(\boxed{-9}\right) \\ + \left(\boxed{5}\right) \end{array}$$

Example: Multiple Vertical Asymptotes

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

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