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.

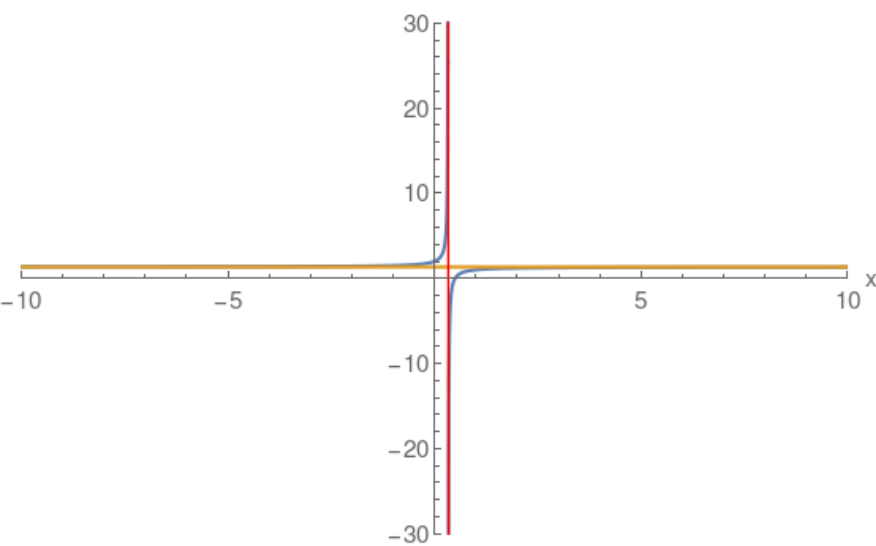**Step 3:** Set the denominator to 0 to solve for vertical asymptotes.

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

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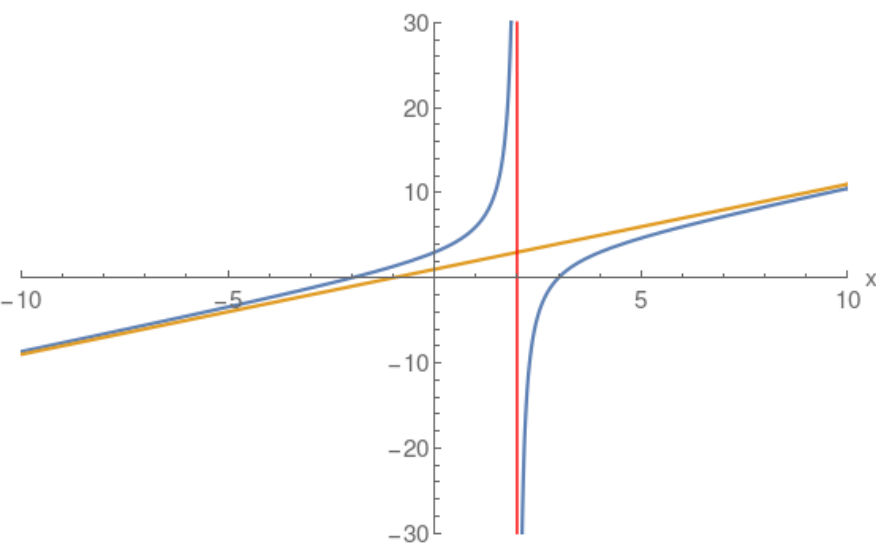**Red and Gold asymptotes.**

Example: Horizontal Asymptote

$$\frac{4\,x-2}{3\,x-1}$$

$$
\begin{array}{lll}
 & & +\left(\boxed{\dfrac{4}{3}}\right) \\
\hline
\boxed{3\,x-1} & (4)\,x & +(-2) \\
 & \left(\boxed{4\,x}\right) & +\left(\boxed{-\dfrac{4}{3}}\right) \\
 & & +\left(\boxed{-\dfrac{2}{3}}\right)
\end{array}
$$

Example: Oblique Linear Asymptote

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

$$
\begin{array}{lll}
 & +\left(\boxed{x}\right) & +\left(\boxed{1}\right) \\
\hline
\boxed{x-2} & (1)\,x^2 \quad +(-1)\,x & +(-6) \\
 & \left(\boxed{x^2}\right) \quad +\left(\boxed{-2\,x}\right) & \\
 & +(1)\,x & +(-6) \\
 & +\left(\boxed{x}\right) & +\left(\boxed{-2}\right) \\
 & & +\left(\boxed{-4}\right)
\end{array}
$$

Example: Multiple Vertical Asymptotes

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

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