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.

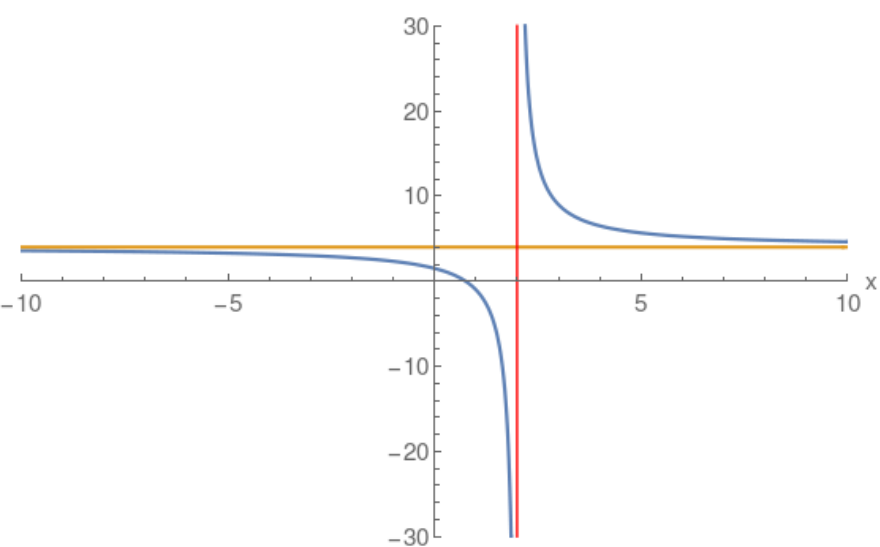**Step 3:** Set the denominator to 0 to solve for vertical asymptotes.

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.

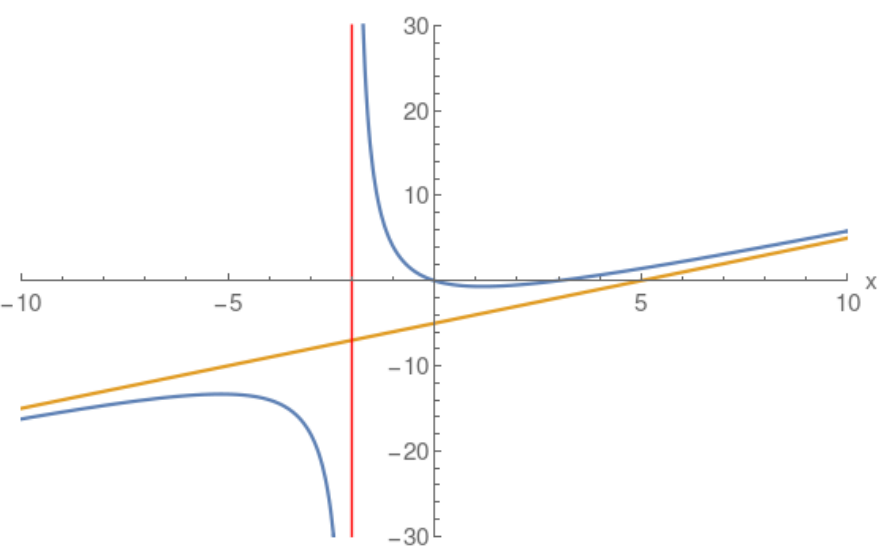## Example: Horizontal Asymptote

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

$$
\begin{array}{r}
+ (\boxed{4}) \\
\hline
x - 2 \quad (4)\,x \quad + (-3) \\
(4\,x) \quad + (-8) \\
+ (\boxed{5})
\end{array}
$$

Example: Oblique Linear Asymptote

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

$$
\begin{array}{r}
+ (\boxed{x}) \quad + (\boxed{-5}) \\
\hline
x + 2 \quad (1)\,x^2 \quad + (-3)\,x \\
(x^2) \quad + (2\,x) \\
+ (-5)\,x \\
+ (-5\,x) \quad + (-10) \\
+ (\boxed{10})
\end{array}
$$

Example: Multiple Vertical Asymptotes

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

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