# 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.
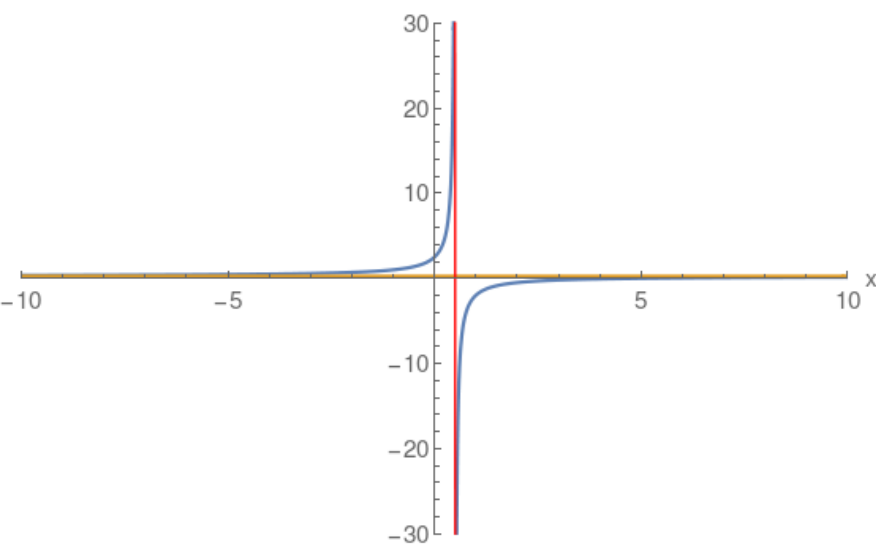**Step 3:** Set the denominator to 0 to solve for vertical asymptotes.
**Step 4:** Perform a long division to find the quotient which specifies the oblique asymptote.

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

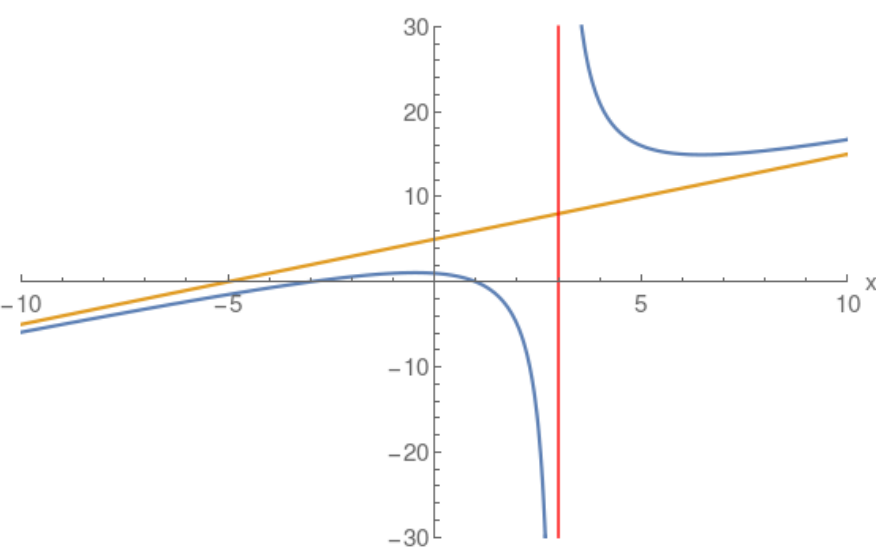## Example: Horizontal Asymptote

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

$$+ \left( \boxed{\frac{1}{4}} \right)$$

$$\boxed{4x-2} \quad (1)\,x \quad + (-5)$$

$$\left( \boxed{x} \right) \quad + \left( \boxed{-\frac{1}{2}} \right)$$

$$+ \left( \boxed{-\frac{9}{2}} \right)$$



## Example: Oblique Linear Asymptote

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

$$+ \left( \boxed{x} \right) \qquad + \left( \boxed{5} \right)$$

$$\boxed{x-3} \quad (1)\,x^2 \quad + (2)\,x \qquad + (-3)$$

$$\left( \boxed{x^2} \right) \quad + \left( \boxed{-3x} \right)$$

$$+ (5)\,x \qquad + (-3)$$

$$+ \left( \boxed{5x} \right) \qquad + \left( \boxed{-15} \right)$$

$$+ \left( \boxed{12} \right)$$



## Example: Multiple Vertical Asymptotes

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

$$+ \left( \boxed{0} \right)$$

$$\left( \boxed{x} \right) \quad + \left( \boxed{2} \right)$$