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

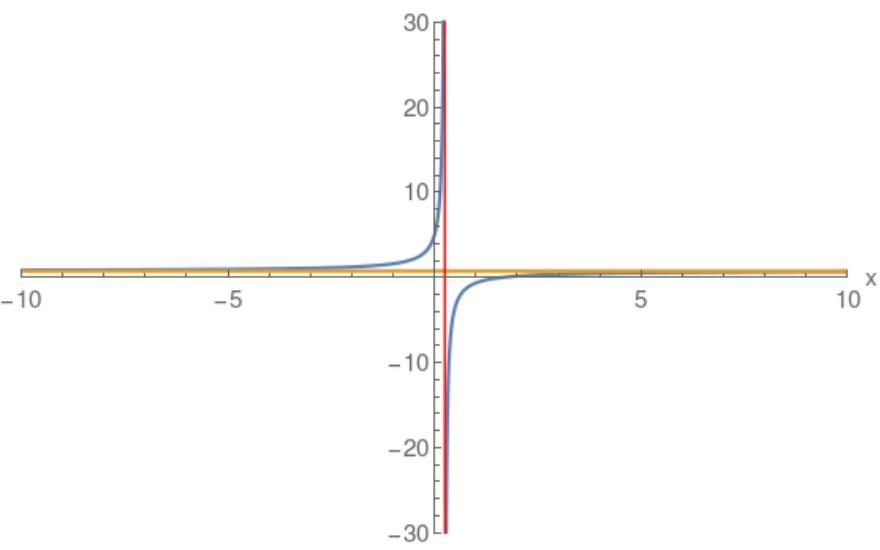
$$\frac{3x-5}{4x-1}$$

$$+\left(\boxed{\frac{3}{4}}\right)$$

$$\boxed{4x-1} \quad (3)x + (-5)$$

$$\left(\boxed{3x}\right) + \left(\boxed{-\frac{3}{4}}\right)$$

$$+\left(\boxed{-\frac{17}{4}}\right)$$



Example: Oblique Linear Asymptote

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

$$+\left(\boxed{x}\right) \qquad +\left(\boxed{7}\right)$$

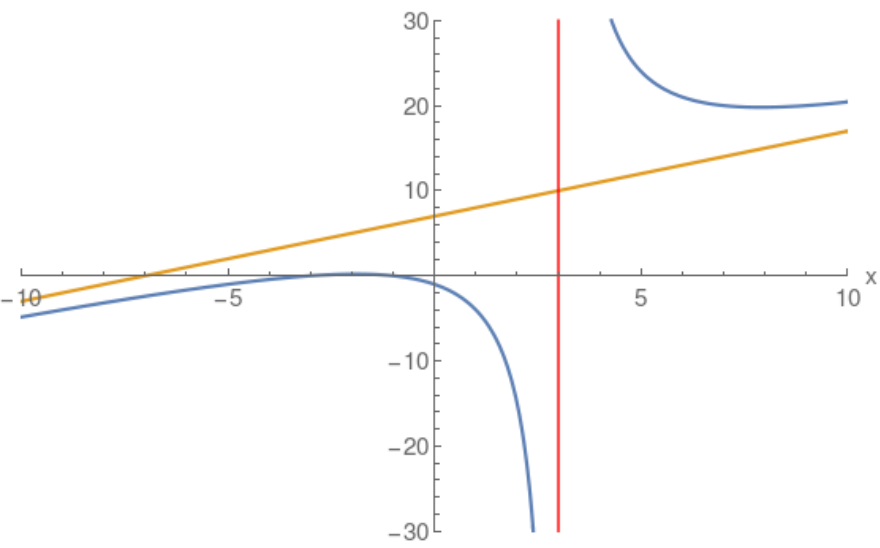
$$\boxed{x-3} \quad (1)x^2 + (4)x + (3)$$

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

$$+(7)x + (3)$$

$$+\left(\boxed{7x}\right) + \left(\boxed{-21}\right)$$

$$+\left(\boxed{24}\right)$$



Example: Multiple Vertical Asymptotes

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

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

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