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.

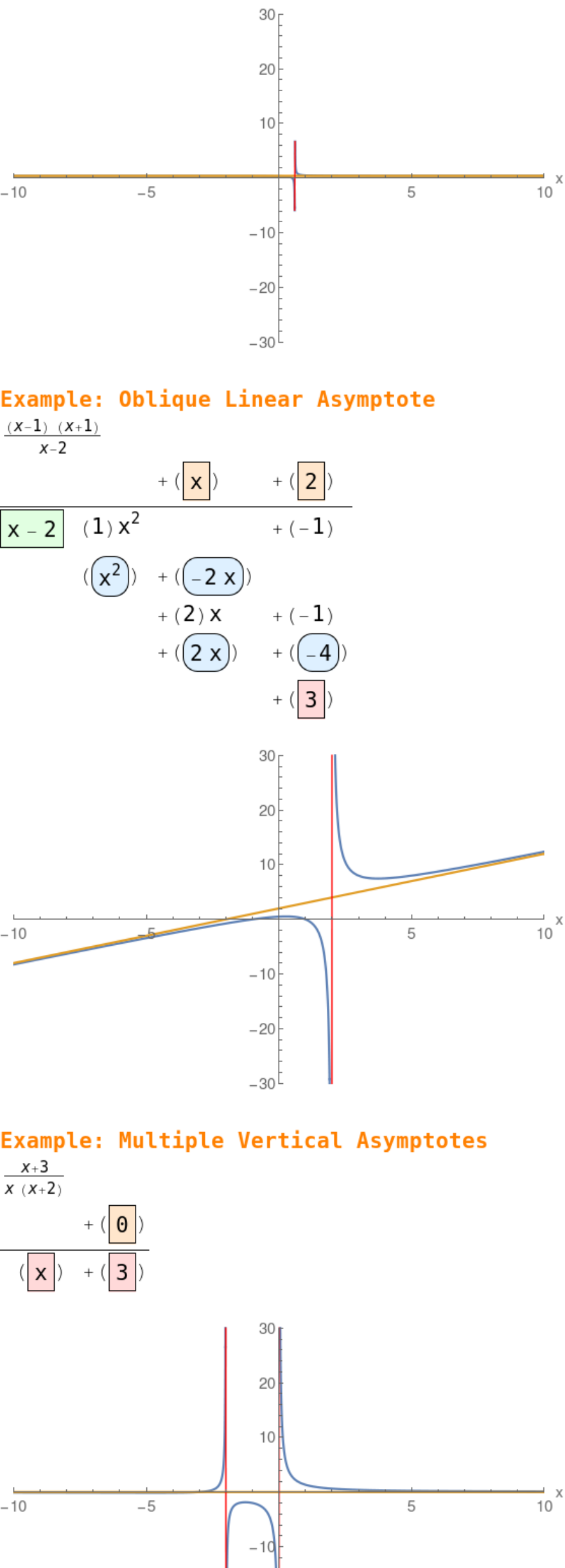
Step 4: Perform a long division to find the quotient which specifies the oblique asymptote.

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

Example: Horizontal Asymptote

$$\frac{2x-1}{5x-3}$$

$$\begin{array}{l|ll} & & +\left(\frac{2}{5}\right) \\ \hline 5x-3 & (2)\,x & +(-1) \\ & \left(2x\right) & +\left(-\frac{6}{5}\right) \\ & & +\left(\frac{1}{5}\right) \end{array}$$



Example: Oblique Linear Asymptote

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

$$\begin{array}{l|ll} & & +\left(x\right) \quad +\left(2\right) \\ \hline x-2 & (1)\,x^2 & +(-1) \\ & \left(x^2\right) & +\left(-2x\right) \\ & & +(2)\,x \quad +(-1) \\ & & +\left(2x\right) \quad +\left(-4\right) \\ & & +\left(3\right) \end{array}$$

Example: Multiple Vertical Asymptotes

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

$$\begin{array}{l|l} & +\left(0\right) \\ \hline \left(x\right) & +\left(3\right) \end{array}$$