1. Given: \[ y = \frac{x^2 - 5x - 6}{x^3 - 1} = \frac{(x-6)(x+1)}{(x-1)(x+1)} \]
   a) Find the horizontal asymptote, if any.
   b) Find the vertical asymptote(s), if any.
   c) Find the x-intercept(s), if any.
   d) Find the y-intercept, if any.
   e) Find the point of removable discontinuity, if any.

   a) \( y = \frac{x^2}{x^2} = y = 1 \)
   b) \( x = 1 \)
   c) \( x = 6 \) or \( (6,0) \)
   d) \( y = \frac{6}{-1} = -6 \) or \( (0,6) \)

2. If \( x - 1 \) is a factor of \( x^3 - kx^2 + 2x \), what is the value of \( k? \)
   1) 0  2) 2  3) 3  4) -3
   \( f(1) = 0 \)
   \( 1^3 - k(1)^2 + 2(1) = 0 \)
   \( 1 - k + 2 = 0 \)
   \( 3 - k = 0 \)
   \( k = 3 \)

3. Write an equation for the following polynomial function

   \[ y = \frac{1}{16} (x+3)(x+1)(x-2)^2 \]

   \[ -8 = a \cdot (1+3)^3(1+1)(1-2)^2 \]
   \[ -8 = a \cdot (4)^3(-1)^2 \]
   \[ -8 = a \cdot (64) \cdot 1 \]
   \[ -8 = a \cdot 64 \]
   \[ a = \frac{-8}{64} = \frac{-1}{8} \]

   \[ y = \frac{-1}{16} (x+3)(x+1)(x-2)^2 \]
4. Find all roots to the following polynomial equation:

\[ 2x^3 - 5x^2 - 28x + 15 = 0 \]

\[
\begin{array}{c|cccc}
 & 2 & -5 & -28 & 15 \\
-3 & 6 & 33 & -15 \\
\hline
 & 2 & -11 & 5 & 0 \\
-3 & 6 & 33 & -15 \\
\end{array}
\]

\[ 2x^2 - 11x + 5 = 0 \]

\[
\frac{(2x-1)(x-5)}{l} = l \]

\[ 2x-1 = 0 \]

\[ x-5 = 0 \]

\[ x = \frac{1}{2} \]

\[ x = 5 \]

5. When air is pumped into an automobile tire, the pressure is inversely proportional to the volume. If the pressure is 35 pounds when the volume is 120 cubic inches, what is the pressure, in pounds, when the volume is 140 cubic inches?

\[
\begin{align*}
(x_1)(y_1) &= (x_2)(y_2) \\
(35)(120) &= (x_2)(140) \\
\frac{4200}{140} &= \frac{140}{140} \\
x_2 &= 30
\end{align*}
\]

6. Write an equation for a rational function with vertical asymptotes at \( x = -3 \) and \( x = 4 \), a horizontal asymptote at \( y = 1 \), has \( x \) intercepts at \( x = 1 \) and \( x = -1 \), and has a \( y \) intercept at \( 1/12 \). Sketch the graph.

\[ y = \frac{a(x-1)(x+1)}{(x+3)(x-4)} \]

\[ y = \frac{a(x)(x)}{x(x)} = \frac{a}{x^2} = \frac{y}{x^2} = \frac{1}{12} \]

\[ a = 1 \]

\[ \frac{1}{12} = \frac{a(-1)(1)}{(3)(-4)} \]

\[ \frac{1}{12} = \frac{a \left(-\frac{1}{2} \right)}{(3)(-4)} \]

\[ a = 1 \]