Divide the polynomial using synthetic division:

\[ \begin{array}{c|cccc}
   3 & 2 & 0 & 5 & 1 \\
   &  & 3 & 3 & 17 \\
--- & --- & --- & --- & --- \\
   & 2 & 4 & 18 & 12 \\
   (x-3)(2x+3)(x^2+13x+39) & & & & \\
\end{array} \]

Is \((x - 1)\) a factor of \(P(x) = x^3 - 4x^2 - x + 4\)? If it is, write \(P(x)\) as a product of two factors.

\[ \begin{align*}
   &1 - 4 - 1 - 14 \\
   &1 - 3 - 7 - 14 \\
   &\text{Yes} \\
\end{align*} \]

\( (x-1)(x^2-2x-14) = 0 \)

\( (x-1)(x-4)(x+4) = 0 \)

Checked: __________

What are the zeros of the function \(f(x) = x^4 - 6x^3 + 8x^2\)? What are their multiplicities?

\( x^2(x^2 - 6x + 8) = 0 \)

\( x^2(x-4)(x-2) = 0 \)

\( x = 0, x = 4, x = 2 \)

Checked: __________

A polynomial equation with rational coefficients has the roots \(\sqrt{3}\) and \(1 + 4i\). List two additional roots.

\(-\sqrt{3}, 1 - 4i\)

Checked: __________

Write a cubic function whose graph passes through the following points:

\((-5, 0), (2, 0)\) and \((1, 0)\)

\[ (x+5)(x-2)(x-1) \]

\[ x^3 + 5x^2 - 2x - 10 \]

\[ x^3 + 5x^2 - 2x + 10 \]

\[ x^3 + 2x^2 - 13x + 10 = 0 \]

Checked: __________

Identify end behavior for the following polynomial functions:

A. \(f(x) = 3x^4 - 2x^2 + x - 5\)

LC, a, degree: \(\frac{3}{4}, \frac{3}{4}\)

\(\text{pos even}\) Left/right: up up

B. \(g(x) = 2x^2 - 5x^3 + 3 - 7x\)

LC, a, degree: \(-\frac{5}{3}, -\frac{5}{3}\)

\(\text{neg odd}\) Left/right: up down

Checked: __________