ALG 2 TEST Review 2 Part 1 (NO CALCULATOR)

1. Write the simplest polynomial in standard form with the given zeros.
   Zeros: 1, 2, and -3
   \[ (x-1)(x-2)(x+3) \]
   \[ (x^2 - 3x + 2)(x + 3) \]
   \[ f(x) = x^3 - 7x + 6 \]

2. Write the simplest polynomial in standard form with the given zeros.
   Zeros: 3i and -1
   \[ (x-3i)(x+3i)(x+1) \]
   \[ (x^2 + 9)(x+1) \]

3. Sketch the graph of a 3rd degree polynomial with a positive leading coefficient, with exactly one negative root with a multiplicity of two and one distinct positive real root.

4. Write the simplest polynomial equation in factored form for the graphs below.

5. Circle all numbers that are possible rational roots of \( P(x) = 2x^3 - 3x^2 + 20x - 6 \).
   \[ \frac{-6}{2} \]
   \[ \pm 1, \pm 2, \pm 3, \pm \frac{1}{2}, \pm \frac{3}{2} \]
   (3 points each blank)

6. What is the end behavior of the polynomial \( f(x) = 3x^{22} - 5x^{23} + 2x - 6 \)?
   \[ \text{As } x \to \infty, f(x) \to -\infty \]
   \[ \text{As } x \to -\infty, f(x) \to +\infty \]
ALG 2 TEST Review Part 2 (CALCULATOR ALLOWED)

9. Use the function: \( f(x) = 3x^4 + 7x^3 - 14x^2 - 24x \); given \((x+3)\) is one factor

a) Factor completely using synthetic division and factoring. Show work algebraically. Show all factors.

\[
\begin{array}{c|ccccc}
-3 & 3 & 7 & -14 & -24 \\
 & & -9 & 6 & 24 \\
\hline
 & 3 & -2 & -8 & 0
\end{array}
\]

Factors: \( x(x+3)(3x+4) \)

\( x = -3 \)

b) Determine all zeros (real and/or complex) of the function. Give the exact values. Show all roots.

\(-3, -\frac{4}{3}, 2, 0\)

10. Use the function: \( f(x) = 2x^4 - 9x^3 + 10x^2 - 3x \); given \((x-3)\) is one factor

a) Factor completely using synthetic division and factoring. Show work algebraically.

\[
\begin{array}{c|cccc}
3 & 2 & -9 & 10 & -3 \\
 & & 6 & -9 & 3 \\
\hline
 & 2 & -3 & 1 & 0
\end{array}
\]

Factors: \( x(x-3)(2x-1)(x-1) \)

\( x = 3 \)

b) Determine all zeros (real and/or complex) of the function. Give the exact values. Show all roots.

\( 0, 3, \frac{1}{2}, 1 \)

11. Use the function: \( f(x) = x^4 - x^3 + 2x^2 - 4x - 8 \)

a) Factor completely using synthetic division and factoring. Show work algebraically.

\[
\begin{array}{c|cccc}
1 & 1 & -1 & 2 & -4 \\
 & & -1 & 2 & 4 \\
\hline
 & 1 & -2 & 4 & 0
\end{array}
\]

\[
(x^3 - 2x^2 + 4x - 8)
\]

\[
(x^2(x-2) + 4(x-2))
\]

\[
(x-2)(x^2+4)
\]

\[
\frac{x-2}{x-2}
\]

\[
\frac{x^2+4}{x^2+4}
\]

\[
x = \pm 2i, \pm 2i
\]

b) Determine all zeros (real and/or complex) of the function. Give the exact values. Show all roots.

\(-1, 2, 2i, -2i\)