

Homework 4.8: Solving Polynomials

Name: Key!

Math 3

Directions: Without using a calculator, find all linear factors and then determine all roots of the function. Sketch a graph with this information.

1. $f(x) = x^3 - 5x^2$

Factors: $x^2(x-5)$

Roots: $\{0, 5\}$

Graph:

2. $f(x) = x^4 - 16$

Factors: $(x-2)(x+2)(x-2i)(x+2i)$

Roots: $\{\pm 2, \pm 2i\}$

Graph:

3. $f(x) = x^3 - 2x^2 + 9x - 18$

Factors: $(x+3i)(x-3i)(x-2)$

Roots: $\{\pm 3i, 2\}$

Graph:

Directions: Using the given factor, find all remaining factors and then determine all roots of the function. Sketch a graph with this information.

4. $f(x) = x^3 + 5x^2 + 2x - 8$

Factor: $(x-1)$

Roots: $\{-4, -2, 1\}$

Graph:

Work shown for problem 4:

$$\begin{array}{r} \downarrow 1 \quad 5 \quad 2 \quad -8 \\ \downarrow 1 \quad 6 \quad 8 \\ \hline 1 \quad 6 \quad 8 \quad 0 \end{array}$$

$x^2 + 6x + 8$

$(x+4)(x+2)$

5. $f(x) = x^3 - 2x^2 + 9x - 18$

Factor: $(x - 2)$

Roots:

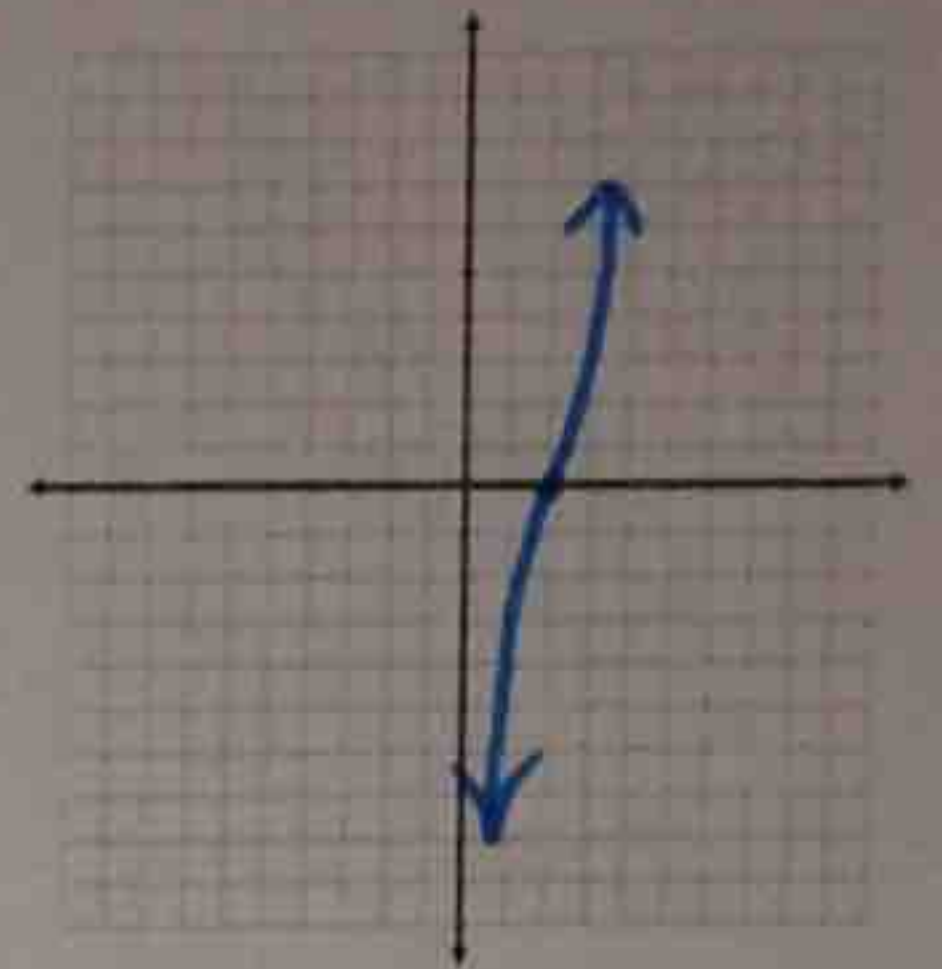
Graph:

$$\begin{array}{r|rrrr} 2 & 1 & -2 & 9 & -18 \\ & \downarrow & 2 & 0 & 18 \\ \hline & 1 & 0 & 9 & 0 \end{array}$$

$(x + 3i)$

$(x - 3i)$

$\{2, \pm 3i\}$



$x^2 + 9$
 $(x + 3i)(x - 3i)$

6. $f(x) = x^3 - 19x - 30$

Factor: $(x + 3)$

Roots:

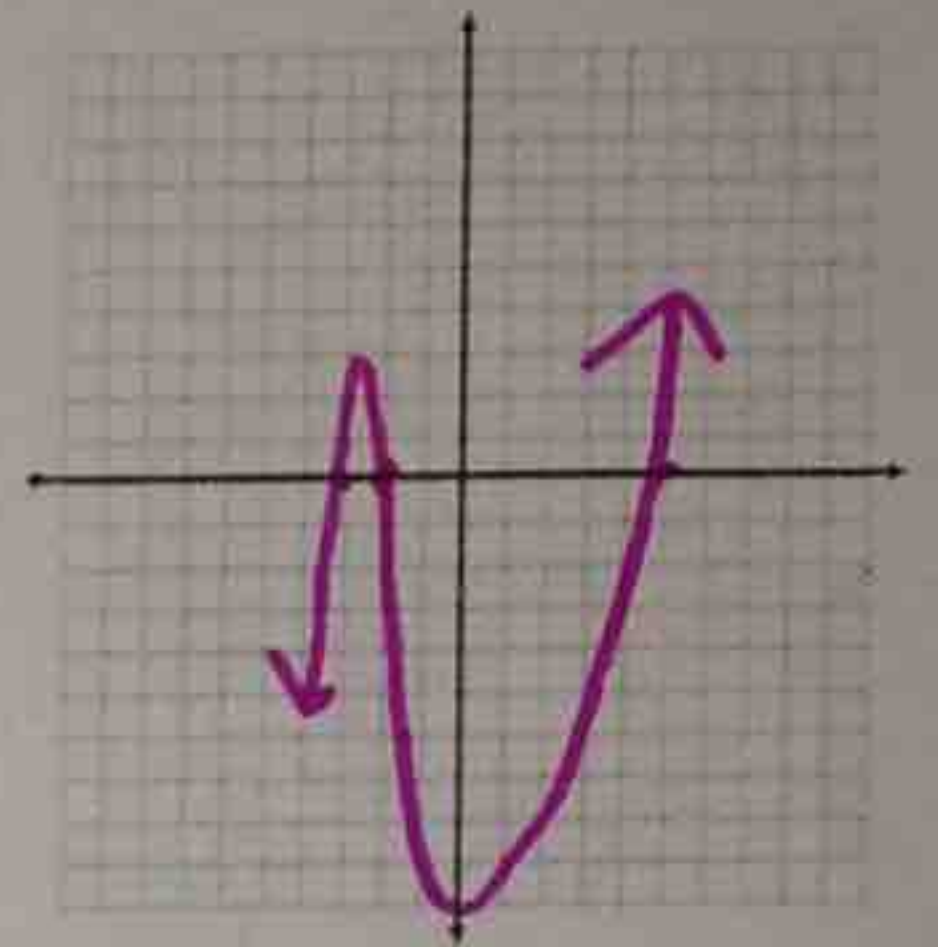
Graph:

$$\begin{array}{r|rrrr} -3 & 1 & 0 & -19 & -30 \\ & \downarrow & -3 & 9 & 30 \\ \hline & 1 & -3 & -10 & 0 \end{array}$$

$(x - 5)$

$(x + 2)$

$\{-3, -2, 5\}$



$x^2 - 3x - 10$

$(x - 5)(x + 2)$

7. $f(x) = x^3 - 2x + 1$

Factor: $(x - 1)$

Roots:

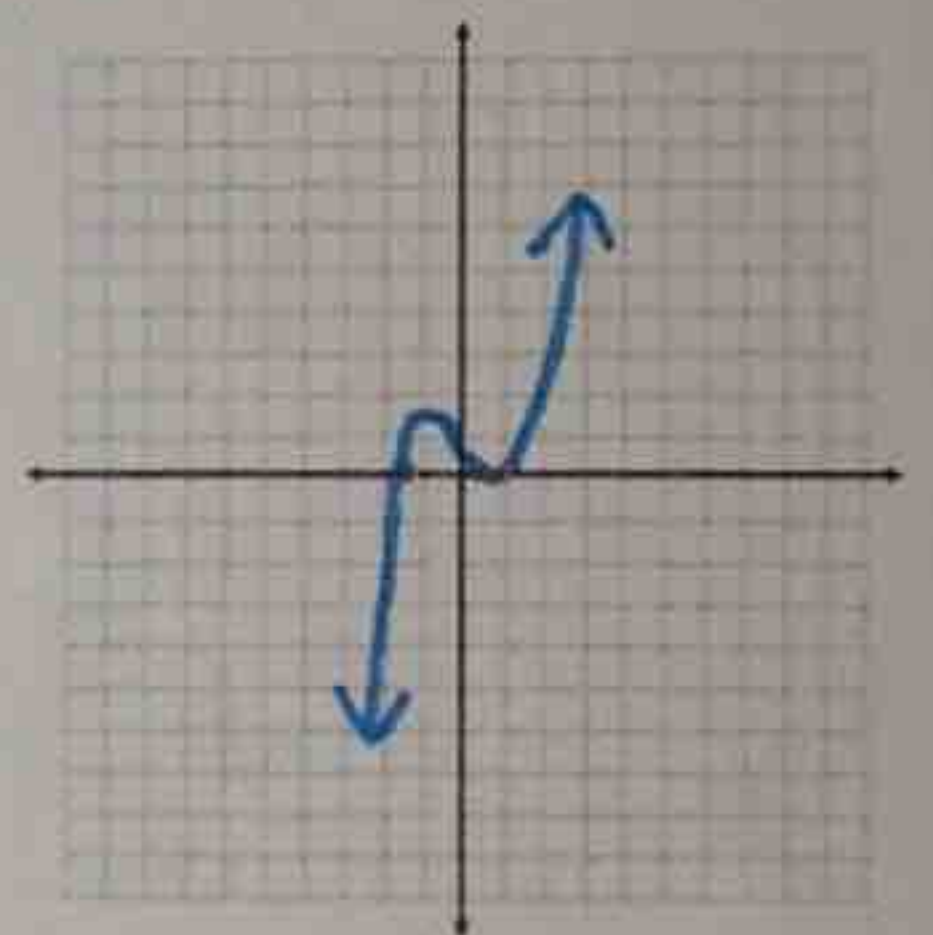
Graph:

Hint: Use Quad Formula to solve for missing roots!

$$\begin{array}{r|rrrr} 1 & 1 & 0 & -2 & 1 \\ & \downarrow & 1 & 1 & -1 \\ \hline & 1 & 1 & -1 & 0 \end{array}$$

$x = \frac{-1 \pm \sqrt{(1)^2 - 4(1)(-1)}}{2(1)}$

$\{1, \frac{-1 \pm \sqrt{5}}{2}\}$



$x^2 + 1x - 1$

$x = \frac{-1 \pm \sqrt{5}}{2}$

$(2x + 1 - \sqrt{5})(2x + 1 + \sqrt{5})$

Directions: Solve for x.

8. $2(x - 2)(x + 1)^2 = 0$

$x = 2$ $x = -1$
 $x = -1$

$\{-1, 2\}$

9. $\log_2 x = 4$

$2^4 = x$ $x = 16$

$\{16\}$

10. $\log_2 4 = x$

$2^x = 4$

$\{2\}$

$x = 2$

11. $\frac{1}{x} = 6$

$1 = 6x$

$x = 1/6$

$\{1/6\}$

12. $x^3 - 1 = 0$ (Hint: Use SOAP to factor and Quadratic Formula to solve)

$(x - 1)(x^2 + x + 1) = 0$

$x - 1 = 0$

$x = 1$

$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(1)}}{2}$

$x = \frac{-1 \pm i\sqrt{3}}{2}$

$\{1, \frac{-1 \pm i\sqrt{3}}{2}\}$

$x = \frac{-1 \pm \sqrt{-3}}{2}$