

**Solve by factoring. Identify the roots of each equation, stating the multiplicity of each root if more than one.**

1.  $x^3 + 9 = x^2 + 9x$

2.  $x^4 - 81 = 0$

3.  $x^4 - 37x^2 = -36$

4.  $x^3 - 4x^2 = 9x - 36$

5.  $x^4 - 36 = 0$

6.  $4x^6 + 4x^5 - 24x^4 = 0$

7.  $x^3 + 3x^2 - 4x = 12$

8.  $x^4 = 16$

9.  $6x^3 = -7x^2 + 5x$

**Solve following the equations. Start by factoring, then use the quadratic formula where needed to find all complex roots of the equation.**

10.  $x^3 + 27 = 0$

11.  $x^3 - 8 = 0$

12.  $x^3 + 64 = 0$

13.  $x^3 - 27 = 0$

14.  $x^3 + 8 = 0$

15.  $x^3 - 64 = 0$

**Not all polynomials are factorable, but the Rational Root Theorem can help you find all possible rational roots of a polynomial equation. List the candidates for rational zeros.**

16.  $2x^4 + 3x^2 - 5 = 0$

17.  $14x^4 - 52x^3 + 28x^2 - 52x + 21 = 0$

Possible numerators: \_\_\_\_\_

Possible numerators: \_\_\_\_\_

Possible denominators: \_\_\_\_\_

Possible denominators: \_\_\_\_\_

Possible rational zeros: \_\_\_\_\_

Possible rational zeros: \_\_\_\_\_

18.  $x^3 - 8 = 0$

19.  $3x^4 - 14x^3 + 12x^2 + 14x - 15 = 0$

Possible numerators: \_\_\_\_\_

Possible numerators: \_\_\_\_\_

Possible denominators: \_\_\_\_\_

Possible denominators: \_\_\_\_\_

Possible rational zeros: \_\_\_\_\_

Possible rational zeros: \_\_\_\_\_

**Find the remaining complex roots of the following equations when given one of the roots. Use synthetic division to get the depressed polynomial, then use the quadratic formula.**

20.  $x^3 - 3x^2 - 4x - 30 = 0, x = 5$

21.  $3x^3 - 2x^2 - 7x - 2 = 0, x = -1$

$\underline{5} \mid 1 \quad -3 \quad -4 \quad -30$

$\underline{-1} \mid 3 \quad -2 \quad -7 \quad -2$

\_\_\_\_\_

\_\_\_\_\_

22.  $x^3 - 6x^2 + 10x - 4 = 0, x = 2$

23.  $x^3 - 5x^2 - 2x + 4 = 0, x = -1$

$\underline{2} \mid 1 \quad -6 \quad 10 \quad -4$

$\underline{-1} \mid 1 \quad -5 \quad -2 \quad 4$

\_\_\_\_\_

\_\_\_\_\_

24.  $x^3 - 8x^2 + 16x - 3 = 0, x = 3$

25.  $2x^3 + 5x^2 - 23x + 10 = 0, x = 2$

$\underline{3} \mid 1 \quad -8 \quad 16 \quad -3$

$\underline{2} \mid 2 \quad 5 \quad -23 \quad 10$

\_\_\_\_\_

\_\_\_\_\_

A polynomial function with rational coefficients has the given zeros. Use these zeros to **a) write the factors of a polynomial function**, then **b) write the equation of the polynomial function in standard form**.

26.  $-4, 3, 1$

a) \_\_\_\_\_

b) \_\_\_\_\_

27.  $3$  and  $2i$

a) \_\_\_\_\_

b) \_\_\_\_\_

28.  $2$  and  $-\sqrt{3}$

a) \_\_\_\_\_

b) \_\_\_\_\_

29.  $5, -2, 1$

a) \_\_\_\_\_

b) \_\_\_\_\_

30.  $2$  and  $-3i$

a) \_\_\_\_\_

b) \_\_\_\_\_

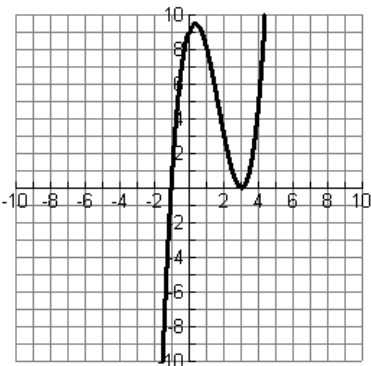
31.  $-3$  and  $\sqrt{2}$

a) \_\_\_\_\_

b) \_\_\_\_\_

Use the graph to locate the roots and the multiplicity of the roots then write the equation of the graph.

32.

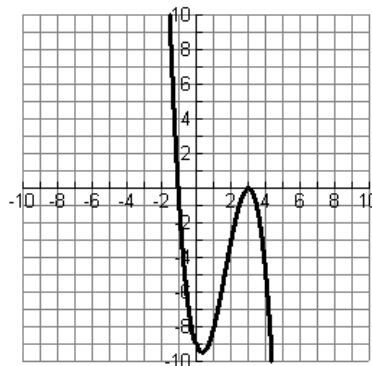


Roots:

\_\_\_\_\_

Equation of the graph \_\_\_\_\_

33.



Roots: \_\_\_\_\_

Equation of the graph \_\_\_\_\_