

Vocabulary: Fill in the blanks.

1. The _____ of _____ states that if $f(x)$ is a polynomial of degree n , where $n > 0$, then f has at least one zero in the complex number system.
2. The _____ states that if $f(x)$ is a polynomial of degree n , where $n > 0$, then $f(x)$ has precisely n linear factors, $f(x) = a_n(x - c_1)(x - c_2) \cdots (x - c_n)$, where c_1, c_2, \dots, c_n are complex numbers.
3. Two complex solutions of the form $a \pm bi$ of a polynomial equation with real coefficients are _____.
4. The expression inside the radical of the Quadratic Formula, $b^2 - 4ac$, is called the _____ and is used to determine types of solutions of a quadratic equation.

Solutions of a Polynomial Equation In Exercises 5–8, determine the number of solutions of the equation in the complex number system.

6. $x^6 + 4x^2 + 12 = 0$ It doesn't say SOLVE.

Using the Discriminant In Exercises 9–16, use the discriminant to find the number of real solutions of the quadratic equation.

10. $2x^2 - x - 1 = 0$ 12. $\frac{1}{3}x^2 - 5x + 25 = 0$

Solving a Quadratic Equation In Exercises 17–26, solve the quadratic equation. Write complex solutions in standard form.

18. $3x^2 - 1 = 0$ 19. $(x + 5)^2 - 6 = 0$
22. $4x^2 + 4x + 1 = 0$ 24. $54 + 16x - x^2 = 0$

Solving a Polynomial Equation In Exercises 27–30, solve the polynomial equation. Write complex solutions in standard form.

27. $x^4 - 6x^2 - 7 = 0$

Graphical and Analytical Analysis In Exercises 31–34, (a) use a graphing utility to graph the function, (b) find all the zeros of the function, and (c) describe the relationship between the number of real zeros and the number of x -intercepts of the graph.

32. $f(x) = x^3 - 4x^2 - 4x + 16$

Finding the Zeros of a Polynomial Function In Exercises 35–52, write the polynomial as a product of linear factors. Then find all the zeros of the function.

36. $f(x) = x^2 - x + 56$ 47. $f(x) = 2x^3 - x^2 + 36x - 18$

Finding the Zeros of a Polynomial Function In Exercises 53–62, use the given zero to find all the zeros of the function.

Function	Zero
57. $g(x) = 4x^3 + 23x^2 + 34x - 10$	$-3 + i$

Finding a Polynomial Function with Given Zeros In Exercises 63–68, find a polynomial function with real coefficients that has the given zeros. (There are many correct answers.)

65. $2, 5 + i$ 68. $-5, -5, 1 + \sqrt{3}i$

Finding a Polynomial Function In Exercises 75–80, find a cubic polynomial function f with real coefficients that has the given complex zeros and x -intercept. (There are many correct answers.)

Complex Zeros	x -Intercept
80. $x = -3 \pm \sqrt{2}i$	$(-2, 0)$

