

Math 95 HW 9 (7.7 & 8.4) The Quadratic Formula with Complex Solutions

Name: _____

Section 7.7

Concepts and Vocabulary:

4. $i^2 =$ _____

7. The standard form for a complex number is _____.

8. $\frac{2+4i}{2}$ in standard form is _____.

9. The real part of $4 - 5i$ is _____.

10. The imaginary part of $4 - 5i$ is _____.

11. The imaginary part of -7 is _____.

Complex Numbers:

In exercises 13 - 21 odd, use i to write the expression.

13. $\sqrt{-5}$

17. $\sqrt{-144}$

21. $\sqrt{-18}$

15. $\sqrt{-100}$

19. $\sqrt{-12}$

Section 8.4

Concepts and Vocabulary:

- Given the quadratic formula $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, the discriminant is _____.
- If the discriminant evaluates to 0, what does that indicate about the quadratic equation?
- Does every quadratic equation have at least one real solution? Explain.

Quadratic Formula:

In exercises 17 - 27, use the quadratic formula to solve the equation. If there are no real solutions, say so.

17. $4x^2 - x - 1 = 0$

23. $2x(x - 3) = 2$

19. $-3x^2 + 2x - 1 = 0$

27. $\frac{1}{2}x(x + 1) = 2x^2 - \frac{3}{2}$

The Discriminant:

In exercises 33 - 37, a graph of $f(x) = ax^2 + bx + c$ is shown in the text. Use it to answer the given questions.

33. a. State whether $a > 0$ or $a < 0$.
- b. Solve $ax^2 + bx + c = 0$, if possible.
- c. Determine whether the discriminant is positive, negative, or zero.
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- b. Solve $ax^2 + bx + c = 0$, if possible.
- c. Determine whether the discriminant is positive, negative, or zero.

In exercises 39 - 45 odd, answer the given questions regarding the given equation.

39. $3x^2 + x - 2 = 0$

- a. Evaluate the discriminant.
- b. How many real solutions are there?

43. $\frac{1}{2}x^2 + \frac{3}{2}x + 2 = 0$

- a. Evaluate the discriminant.
- b. How many real solutions are there?

In exercises 47 - 55, use the quadratic formula to find any x -intercepts on the graph of the function.

47. $f(x) = x^2 - 2x - 1$

53. $f(x) = x^2 + 9$

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

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

In exercises 67 - 85, solve the equation. Write complex solutions in standard form using set notation.

67. $x^2 - 3 = 0$

69. $x^2 + 2 = 0$

$$71. x^2 - x + 2 = 0$$

$$79. 5x^2 + 2x + 4 = 0$$

$$73. 2x^2 + 3x + 4 = 0$$

$$81. \frac{1}{2}x^2 + \frac{3}{4}x + 1 = 0$$

$$77. x^2 + x = -2$$

$$85. x(2x - 1) = 1 + x$$

Applications:

120. Two cars leave an intersection, one traveling south and one traveling east, as shown in the figure in the text. After 1 hour the two cars are 50 miles apart and the car traveling east has traveled 10 miles farther than the car traveling south. How far did each car travel?
123. When water runs out of a hole in a cylindrical container, the height of the water in the container can often be modeled by a quadratic function. The data in the table show the height y in centimeters of water at 30-second intervals in a metal can that has a small hole in it.

Time	0	30	60	90	120	150	180
Height	16	11.9	8.4	5.3	3.1	1.4	0.5

These data are modeled by

$$f(x) = 0.0004x^2 - 0.15x + 16.$$

- a. Explain why a linear function would not be appropriate for modeling these data.
- b. Use the table to estimate the time at which the height was 7 centimeters.
- c. Use $f(x)$ and the quadratic formula to estimate the time at which the height was 7 centimeters. How does this compare to the value you found in part (b)?