

4-4 HW Answer Key

1. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. $b^2 - 4ac$

3. 2 complex solutions

4. 1 real solution

5. 2 real solutions

6. discriminant = -324; 2 complex solutions; $x = \pm 9i$

7. discriminant = -104; 2 complex solutions; $x = \frac{2}{3} \pm \frac{i\sqrt{26}}{3}$

8. discriminant = 16; 2 real solutions; $x = 3, -1$

9. discriminant = 0; 1 real solution; $x = 2$

10. discriminant = -56; 2 complex solutions; $x = \frac{2}{5} \pm \frac{i\sqrt{14}}{10}$

Name Key

Alg 2 Homework 4-4

1. Write the quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. What is the discriminant? $b^2 - 4ac$

3. If discriminant is negative, what kind of solutions do you have? *2 complex solutions*

4. If discriminant is zero, what kind of solutions do you have? *1 real solution*

5. If discriminant is positive, what kind of solutions do you have? *2 real solutions*

For 6 - 10 do the following:

1. Compute the value of the discriminant of the quadratic equation.
2. Use the value of the discriminant to predict the number and type of solutions.
3. Find all real and complex solutions.

6. $x^2 + 81 = 0$
 1. $b^2 - 4ac = 0 - 4(1)(81)$
 $= -324$

2. *2 complex solutions*

3. $x = \frac{0 \pm \sqrt{-324}}{2(1)}$
 $= \frac{\pm 18i}{2}$
 $= \pm 9i \quad \{ \pm 9i \}$

7. $3x^2 - 4x + 10 = 0$
 1. $b^2 - 4ac = 16 - 4(3)(10)$
 $= -104$

2. *2 complex solutions*

3. $x = \frac{4 \pm \sqrt{-104}}{2(3)}$
 $= \frac{4 \pm i\sqrt{4} \sqrt{26}}{6}$
 $= \frac{2 \pm i\sqrt{26}}{3} \quad \left\{ \frac{2}{3} \pm \frac{i\sqrt{26}}{3} \right\}$

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$$8. x^2 - 2x - 3 = 0$$

$$1. b^2 - 4ac = 4 - 4(1)(-3) = 16$$

2. 2 real solutions

$$3. x = \frac{2 \pm \sqrt{16}}{2(1)}$$

$$= \frac{2 \pm 4}{2} = 1 \pm 2 \rightarrow \begin{matrix} 3 \\ -1 \end{matrix}$$

$$\{3, -1\}$$

$$9. x^2 + 4 = 4x \quad x^2 - 4x + 4 = 0$$

$$1. b^2 - 4ac = 16 - 4(1)(4) = 0$$

2. 1 real solution

$$3. x = \frac{4 \pm \sqrt{0}}{2(1)}$$

$$= 2 \quad \{2\}$$

$$10. 9x - 9x^2 = 3 + x + x^2$$

$$0 = 10x^2 - 8x + 3$$

$$1. b^2 - 4ac = 64 - 4(10)(3) = -56$$

2. 2 complex solutions

$$3. x = \frac{8 \pm \sqrt{-56}}{2(10)}$$

$$= \frac{8 \pm i\sqrt{4 \cdot 14}}{20} = \frac{8 \pm 2i\sqrt{14}}{20} = \frac{4 \pm i\sqrt{14}}{10}$$

$$\left\{ \frac{4}{10} \pm \frac{i\sqrt{14}}{10} \right\}$$

Day 5 Review Answer Key

- | | | | |
|---|--------------------|--|-------------|
| 1. a) $4 + 9i$ | b) $20 + 3i$ | c) $3 + 10i$ | d) $5 + 3i$ |
| 2. a) $11 + 41i$ | b) $6 + 22i$ | c) $-17 - 17i$ | |
| 3. 26, which is a real number | | | |
| 4. $13i$, which is an imaginary number | | | |
| 5. a) $20i$ | b) 8 | c) $8 + 20i$ | |
| 6. i ; $\sqrt{-1}$ | | | |
| 7. $i^4 = 1$ and $i^{\text{any mult. of 4}} = 1$, so $i^{\text{any power}} = i, -1, -i, \text{ or } 1$ | | | |
| 8. $-1, -i, 1, i, -1$ | 13. $15i\sqrt{6}$ | 22. See diagram in slide | |
| 9. $i\sqrt{r}$ | 14. -42 | 23. $x = 6, y = 9$ | |
| 10. $10i$ | 15. $-2\sqrt{30}$ | 24. Discriminant = -80 | |
| 11. $-12i$ | 16. $-3i\sqrt{10}$ | Answer = $\left\{-\frac{1}{4} \pm \frac{i\sqrt{5}}{4}\right\}$ | |
| 12. $4i\sqrt{5}$ | 17. -19 | | |
| | 18. $30 - 4i$ | | |
| | 19. $-6 + 29i$ | | |
| | 20. $51 + 18i$ | | |
| | 21. $x^2 + 25$ | | |

Review

Algebra 2 Unit 4 Day 5

1. Find each of the following sums and differences.

a) $(-2 + 7i) + (6 + 2i) = 4 + 9i$

b) $(8 + 4i) + (12 - i) = 20 + 3i$

c) $(5 + 3i) - (2 - 7i) = 3 + 10i$

d) $(-3 + 5i) - (-8 + 2i) = 5 + 3i$

2. Find the following products. Write each of your answers as a complex number in the form $a+bi$.

a) $(3 + 5i)(7 + 2i)$

$$= 21 + 6i + 35i + 10i^2$$

$$= 21 + 41i - 10$$

$$= 11 + 41i$$

b) $(-2 + 6i)(3 - 2i)$

$$= -6 + 4i + 18i - 12i^2$$

$$= -6 + 22i + 12$$

$$= 6 + 22i$$

c) $(4 + i)(-5 - 3i)$

$$= -20 - 12i - 5i - 3i^2$$

$$= -20 - 17i + 3$$

$$= -17 - 17i$$

3. Show that the product of $(2+3i)$ and $(4-6i)$ results in a purely real number.

$$(2+3i)(4-6i) = 8 - 12i + 12i - 18i^2$$

$$= 8 + 18$$

$$= 26 \rightarrow \text{Real \#}$$

4. Show that the product of $(2+3i)$ and $(3+2i)$ results in a purely imaginary number.

$$(2+3i)(3+2i) = 6 + 4i + 9i + 6i^2$$

$$= 6 + 13i - 6$$

$$= 13i \rightarrow \text{Imag. \#}$$

5. Give an example of each number:

a) Pure imaginary $20i$

b) Pure real 8

c) Complex (not pure imaginary or pure real) $8 + 20i$

6. The imaginary number i is equal to $\sqrt{-1}$.

7. Explain the 'cycle' of i .

$i^1 = i$ $i^2 = -1$ $i^3 = -i$ $i^4 = 1$ and $i^{\text{mult. of 4}} = 1$
 so, $i^{\text{any power}}$ is $i, -1, -i$ or 1

8. What are the values of: $i^2 = -1$ $i^3 = -i$ $i^4 = 1$ $i^5 = i$ $i^{30} = i^{28} \cdot i^2 = -1$

9. How do you simplify $\sqrt{-r}$? $i\sqrt{r}$

Simplify:

10. $\sqrt{-100} = 10i$

11. $-\sqrt{-144} = -12i$

12. $\sqrt{-80} = i\sqrt{16}\sqrt{5} = 4i\sqrt{5}$

13. $5\sqrt{-54} = 5i\sqrt{9}\sqrt{6} = 15i\sqrt{6}$

14. $\sqrt{-49} \cdot \sqrt{-36} = 7i(6i) = 42i^2 = -42$

15. $\sqrt{-5} \cdot \sqrt{-24} = i\sqrt{5} \cdot i\sqrt{24} = i^2\sqrt{120} = -1\sqrt{4}\sqrt{30} = -2\sqrt{30}$

16. $-\sqrt{-18} \cdot \sqrt{5} = -i\sqrt{18}\sqrt{5} = -i\sqrt{90} = -i\sqrt{9}\sqrt{10} = -3i\sqrt{10}$

17. $(\sqrt{-19})^2 = -19$

Add or subtract the following complex numbers.

18. $(22 + 7i) + (8 - 11i) = 30 - 4i$

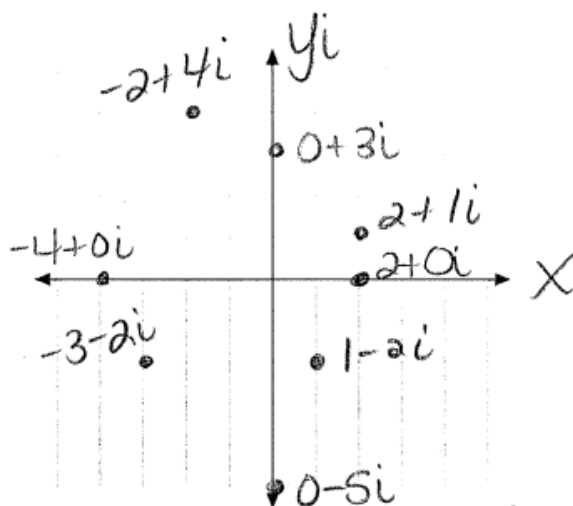
19. $(2 + 16i) - (8 - 13i) = -6 + 29i$

Multiply the following complex numbers.

20. $(3 + 4i)(9 - 6i) = 27 - 18i + 36i - 24i^2$
 $= 27 + 18i + 24$
 $= 51 + 18i$

21. $(x + 5i)(x - 5i) = x^2 - 5xi + 5xi - 25i^2$
 $= x^2 + 25$

22. Plot and label a complex number in each quadrant and on both axes on the graph below. Be sure to label the axes.



23. Find the real values of x and y if $11x + 8yi = 66 + 72i$.

$$11x = 66$$

$$x = 6$$

$$8y = 72$$

$$y = 9$$

$$x = \underline{6}$$

$$y = \underline{9}$$

24. Compute the value of the discriminant of the quadratic equation, and then solve using the quadratic formula.

$$8x^2 + 4x + 3 = 0$$

$$b^2 - 4ac = 16 - 4(8)(3)$$

$$= -80$$

$$x = \frac{-4 \pm \sqrt{-80}}{2(8)}$$

$$= \frac{-4 \pm i\sqrt{16}\sqrt{5}}{16}$$

$$\frac{-4 \pm 4i\sqrt{5}}{16}$$

$$= \frac{-1 \pm i\sqrt{5}}{4}$$

Discriminant $\underline{-80}$

Answer $\left\{ \frac{-1 \pm i\sqrt{5}}{4} \right\}$

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25. Solve the equation $2x^2 + 5x + 8 = 0$. Express the answer in $a + bi$ form.

$$\begin{aligned}b^2 - 4ac &= 25 - 4(2)(8) \\ &= -39\end{aligned}$$

$$x = \frac{-5 \pm \sqrt{-39}}{2(2)}$$

$$x = \frac{-5 \pm i\sqrt{39}}{4}$$

$$x = \frac{-5}{4} \pm \frac{\sqrt{39}}{4}i$$