

Solution

$$\text{a. } (6-2i)+(1-2i)=(6+1)+(-2-2)i=7-4i$$

$$\begin{aligned}\text{b. } (-8-\sqrt{2}i)-(-8+\sqrt{2}i) &= (-8-(-8))+(-\sqrt{2}-\sqrt{2})i \\ &= (-8+8)+(-2\sqrt{2})i \\ &= 0-2\sqrt{2}i \\ &= -2\sqrt{2}i \text{ (or } -2i\sqrt{2}\text{)}\end{aligned}$$

$$\text{c. } (\sqrt{3}-2i)+(1+\sqrt{5}i)=(\sqrt{3}+1)+(-2+\sqrt{5})i=(\sqrt{3}+1)+(\sqrt{5}-2)i$$

Note: Here, the coefficients do not simplify. This means that the real part is $\sqrt{3}+1$ and the imaginary part is $\sqrt{5}-2$.

Now work margin exercise 4.**Margin Exercise Answers**

$$\text{1. a. } 10i \text{ b. } 7i \text{ c. } 3i\sqrt{2} \text{ d. } 6i\sqrt{2} \quad \text{2. a. real: } 0; \text{ imaginary: } 5 \text{ b. real: } 14; \text{ imaginary: } \sqrt{7}$$

$$\text{c. real: } \frac{6}{5}; \text{ imaginary: } -\frac{11}{5} \text{ d. real: } -13; \text{ imaginary: } 0 \quad \text{3. a. } x=10 \text{ and } y=-2$$

$$\text{b. } y=1 \text{ and } x=-5 \quad \text{4. a. } 7+4i \text{ b. } -4\sqrt{2}i \text{ c. } (4+\sqrt{2})+(8-\sqrt{5})i$$

13.8 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

- Adding and subtracting complex numbers is similar to adding and subtracting _____.
- The square roots of negative numbers are not real numbers but are _____ numbers.
- Complex numbers consist of two parts: a/an _____ part and a/an _____ part.
- The standard form of a complex number is _____.
- The expression $\sqrt{-a}$ can be rewritten as $\sqrt{a} \cdot \sqrt{-1}$ and _____.
- The value i is defined to be _____.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

- An irrational number is a real number.
- Every real number is a complex number.
- If $a+bi=c+di$, then $a=d$ and $b=c$.
- The square root of negative one is one.

Practice

Find the real part and the imaginary part of each of the complex numbers. See Example 2.

1. $4 - 3i$

2. $\frac{3}{4} + i$

3. $-11 + \sqrt{2}i$

4. $6 + \sqrt{3}i$

5. $\frac{3}{8}$

6. $\frac{4}{7}i$

7. $\frac{4+7i}{5}$

8. $\frac{2-i}{4}$

9. $\frac{2}{3} + \sqrt{17}i$

10. $-\sqrt{5} + \frac{\sqrt{2}}{2}i$

Simplify each radical. See Example 1.

11. $\sqrt{-49}$

12. $\sqrt{-121}$

13. $-\sqrt{-64}$

14. $-\sqrt{-169}$

15. $\sqrt{147}$

16. $\sqrt{128}$

17. $2\sqrt{-150}$

18. $4\sqrt{-99}$

19. $-2\sqrt{-108}$

20. $2\sqrt{175}$

21. $\sqrt{242}$

22. $\sqrt{-192}$

23. $\sqrt{-1000}$

24. $\sqrt{-243}$

Solve the equations for x and y . See Example 3.

25. $x + 3i = 6 - yi$

26. $2x - 8i = -2 + 4yi$

27. $\sqrt{5} - 2i = y + xi$

28. $\sqrt{2} - 2yi = 3x + 6i$

29. $\sqrt{2} + i - 3 = x + yi$

30. $\sqrt{5}i - 3 + 4i = x + yi$

31. $3x + 2 - 7i = i - 2yi + 5$

32. $x + yi + 8 = 2i + 4 - 3yi$

33. $x + 2i = 5 - yi - 3 - 4i$

34. $2x + 3 + 6i = 7 - yi - 2i$

35. $2 + 3i + x = 5 - 7i + yi$

36. $11i - 2x + 4 = 10 - 3i + 2yi$

37. $2x - 2yi + 6 = 6i - x + 2$

38. $x + 4 - 3x + i = 8 + yi$

Find each sum or difference as indicated. See Example 4.

39. $(2 + 3i) + (4 - i)$

40. $(7 - i) + (3 + 6i)$

41. $(4 + 5i) - (3 - 2i)$

42. $(-3 + 2i) - (6 + 2i)$

43. $(4-3i)+(2-3i)$
44. $(7+5i)+(6-2i)$
45. $(8+9i)-(8-5i)$
46. $(-6+i)-(2+3i)$
47. $(\sqrt{5}-2i)+(3-4i)$
48. $(4+3i)-(\sqrt{2}+3i)$
49. $(7+\sqrt{6}i)+(-2+i)$
50. $(\sqrt{11}+2i)+(5-7i)$
51. $(\sqrt{3}+\sqrt{2}i)-(5+\sqrt{2}i)$
52. $(\sqrt{5}+\sqrt{3}i)+(1-i)$
53. $(5+\sqrt{-25})-(7+\sqrt{-100})$
54. $(1+\sqrt{-36})-(-4-\sqrt{-49})$
55. $(13-3\sqrt{-16})+(-2-4\sqrt{-1})$
56. $(7+\sqrt{-9})-(3-2\sqrt{-25})$
57. $(4+i)+(-3-2i)-(-1-i)$
58. $(-2-3i)+(6+i)-(2+5i)$
59. $(7+3i)+(2-4i)-(6-5i)$
60. $(-5+7i)+(4-2i)-(3-5i)$

Writing & Thinking

61. Answer the following questions and give a brief explanation of your answer.
- Is every real number a complex number?
 - Is every complex number a real number?
62. List 5 numbers that do and 5 numbers that do not fit each of the following categories (if possible).
- | | |
|--------------------|--------------------------|
| a. rational number | d. pure imaginary number |
| b. integer | e. complex number |
| c. real number | f. irrational number |