Name

2-4 Additional Practice

Complex Numbers and Operations

Use square roots to solve each equation. Write your solutions using the imaginary unit, *i*.

1. $x^2 = -81$

$x = \pm 9i$

2. $x^2 = -625$

$x = \pm 25i$

3. $x^2 = -144$

$x = \pm 12i$

Simplify each expression.

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

$3 + i$

5. $(-6 + 7i) + (6 - 7i)$

0

6. $(8 + 5i) + (6 - 7i)$

$14 - 2i$

Write each product in the form *a* + *bi*.

7. $(4 - 3i)(-5 + 4i)$

$-8 + 31i$

8. $(2 - i)(-3 + 6i)$

$15i$

9. $(5 - 3i)(5 + 3i)$

34

Write the quotient in the form *a* + *bi*.

10. $\frac{5 + 2i}{4i}$

$\frac{1}{2} - \frac{5i}{4}$

11. $\frac{3 - 2i}{4 - 3i}$

$\frac{18}{25} + \frac{i}{25}$

12. $\frac{3i}{-2 + i}$

$\frac{3}{5} - \frac{6i}{5}$

13. Why does multiplying $a + bi$ by the complex conjugate $a - bi$ eliminate i from the expression?

$a + bi$ and $a - bi$ are factors of a difference of two perfect squares. $bi - bi = 0$, removing the i from the middle term. bi times bi is b^2i^2 which is the same as $-b$ because $i^2 = -1$.

Solve the equations below using factoring.

14. $x^2 + 360 = 0$

$x = 6i, x = -6i$

15. $x^2 + 40 = 0$

$x = 2i, x = -2i$

16. $x^2 + 10 = 0$

$x = -i, x = i$

17. The total resistance of a circuit is given by the formula $R_T = \frac{1}{R_1} + \frac{1}{R_2}$. $R_1 = 4 + 6i$ ohms and $R_2 = 2 - 4i$ ohms. What is R_T?

$R_T = \frac{23}{130} + \frac{11i}{130}$ ohms.