Simplify each expression. Assume all variables represent positive numbers.

1. $8^{2/3}$

2. $4^{-3/2}$

3. $\sqrt{21} \div \sqrt{7}$

4. $2\sqrt{5} \cdot 3\sqrt{5}$

5. $\sqrt{20} + \sqrt{5}$

6. $\sqrt{5} + \dfrac{1}{\sqrt{5}}$

7. $2^{1/2} \cdot 2^{1/2}$

8. $\sqrt{72}$

9. $\sqrt{\dfrac{5}{12}}$

10. $\dfrac{6 + \sqrt{18}}{6}$

11. $(2\sqrt{3} + 1)(\sqrt{3} - 2)$

12. $\sqrt[4]{32a^5y^8}$

13. $\dfrac{1}{\sqrt[4]{2x^2}}$

14. $\sqrt{\dfrac{8a^9}{b^3}}$

15. $\sqrt[3]{-27x^9}$

16. $\sqrt{20m^3}$

17. $x^{1/2} \cdot x^{1/4}$

18. $(9y^4x^{1/2})^{1/2}$

19. $\sqrt[3]{40x^7}$

20. $(4 + \sqrt{3})^2$

Find the domain of each radical expression. Use interval notation.

21. $\sqrt{4 - x}$

22. $\sqrt[3]{5x - 3}$

Rationalize the denominator and simplify.

23. $\dfrac{2}{5 - \sqrt{3}}$

24. $\dfrac{\sqrt{6}}{4\sqrt{3} + \sqrt{2}}$

Write each expression in the form $a + bi$.

25. $(3 - 2i)(4 + 5i)$

26. $i^4 - i^5$

27. $\dfrac{3 - i}{1 + 2i}$

28. $\dfrac{-6 + \sqrt{-12}}{8}$

Find all real or imaginary solutions to each equation.

29. $(x - 2)^2 = 49$

30. $2\sqrt{x + 4} = 3$

31. $w^{2/3} = 4$

32. $9y^2 + 16 = 0$

33. $\sqrt{2x^2 + x - 12} = x$

34. $\sqrt{x - 1} + \sqrt{x + 4} = 5$

Show a complete solution to each problem.

35. Find the exact length of the side of a square whose diagonal is 3 feet.

36. Two positive numbers differ by 11, and their square roots differ by 1. Find the numbers.

37. If the perimeter of a rectangle is 20 feet and the diagonal is $2\sqrt{13}$ feet, then what are the length and width?

38. The average radius R of the orbit of a planet around the sun is determined by $R = T^{2/3}$, where T is the number of years for one orbit and R is measured in astronomical units (AU). If it takes Pluto 248.530 years to make one orbit of the sun, then what is the average radius of the orbit of Pluto? If the average radius of the orbit of Neptune is 30.08 AU, then how many years does it take Neptune to complete one orbit of the sun?