Chapter 3

Exercise Set 3.1

Simplify the expression, writing it without any negative exponents.

1. $(-2x^4)^3$

2. $(6y)^3$

3. $(-3a^4bc^5)^2$

4. $-3(-2x^2)^3$

5. $(-7a^4)^2$

6. $a^2(a^4b^3c)^5$

7. $\dfrac{(xy^2z^3)^4}{(x^3y^2z)^3}$

8. $\dfrac{(2y^3)^4}{2y^5}$

9. $\dfrac{(2a^3)^2(3a^4)}{(a^3)^4}$

10. $\left((-x^3y)^2z^4\right)^3$

11. $\left(\dfrac{-u^2v^3}{4u^4v}\right)^2$

12. $\left(\dfrac{2xy^6z}{xy^2z^3}\right)^3$

13. $(2x^3)^{-3}$

14. $(ab^2)^{-7}$

15. u^3u^{-9}

16. $(-2x^5)^{-2}$

17. $(x^2y^{-3})^{-4}$

18. $(-u^{-4})^3(2u^5)^{-2}$

19. $(-4x^2y^{-7})^3$

20. $\left(-3x^{-2}y\right)^2(2x^3y^{-4})^{-2}$

21. $(-2a^3b^{-4}c^{-7})^3$

22. $\dfrac{a^{-3}b^4}{a^{-5}b^5}$

23. $\left(\dfrac{a^{-1}}{5b^4}\right)^2$

24. $\left(\dfrac{-2a^4}{b^2}\right)^{-3}$

25. $\left(\dfrac{9y}{y^{-5}}\right)^{-1}$

26. $\left(\dfrac{x^6}{4x^2}\right)^{-2}$

27. $\left(\dfrac{x^8}{x^{-2}}\right)^3\left(\dfrac{x^{-3}}{2x}\right)^2$

28. $\dfrac{(-a^2b^3)^{-2}}{a^{-4}b^2}$

29. $\left(\dfrac{x^{-1}yz^{-2}}{x^{-8}y^{-5}z}\right)^{-1}$

30. $\left(\dfrac{xy^{-2}z^{-3}}{x^2y^3z^{-4}}\right)^{-3}$

31. $(3ab^2c)\left(\dfrac{2a^2b}{c^3}\right)^{-2}$

32. $\dfrac{1}{4}x^2y^{-5}\left(3\dfrac{x^{-4}}{y^{-2}}\right)^2$

33. $\left(\dfrac{x^5}{2y^{-3}}\right)^3\left(\dfrac{6x^{-8}}{y}\right)^2$

Find the value of the algebraic expression at the specified values of its variable or variables without using a calculator. Simplify the expression before evaluating. Check your answer using a calculator.

34. $x^3 x^{-4}$; $\quad x = 5$

35. $(x^{-2})^3$; $\quad x = -2$

36. $(2x^{-1})^3$; $\quad x = 3$

37. $(x^2 + y^2)^{-1}$; $\quad x = -1, y = 2$

38. $x^{-2} + y^{-2}$; $\quad x = 1, y = 2$

39. $(x+y)^{-1}$; $\quad x = 3, y = 5$

40. $x^{-1} + y^{-1}$; $\quad x = 3, y = 5$

41. $\left(\dfrac{x}{y}\right)^{-2}$; $\quad x = -2, y = 3$

42. $\left(\dfrac{x}{y}\right)^{-2}$; $\quad x = 1, y = 3$

43. $\dfrac{x^2}{x^{-3}}$; $\quad x = -2$

44. $\dfrac{x^{-3}}{x^{-2}}$; $\quad x = 7$

45. $\left(\dfrac{x^{-2}}{y}\right)^{-1}$; $\quad x = 3, y = 7$

Exercise Set 3.2

Simplify the expression. Assume that all variables represent positive numbers.

1. $\sqrt{12x^6}$ **2.** $\sqrt{32x^2y^{10}}$ **3.** $\sqrt{81x^9}$ **4.** $\sqrt{25x^5y^9}$

5. $\sqrt{24z^7}$ **6.** $\sqrt{18y^3z^{12}}$ **7.** $\sqrt{8x^5y^{17}}$ **8.** $\sqrt{3x^8y^5z^7}$

9. $\sqrt{\dfrac{20}{x^{20}}}$ **10.** $\sqrt{\dfrac{x^6}{y^{10}z^2}}$ **11.** $\sqrt{\dfrac{32x^3}{9y^2}}$ **12.** $\sqrt{\dfrac{y^9z^{13}}{w^{12}}}$

13. $\sqrt{72x^5y^9}$ **14.** $\sqrt{\dfrac{49}{8x^5}}$ **15.** $\sqrt{\dfrac{27y^8}{8z^3}}$ **16.** $\sqrt{\dfrac{52y^8}{45z^{12}}}$

17. $\sqrt{\dfrac{18x^5}{2x^{-2}}}$ **18.** $\sqrt{\dfrac{x^5yz^8}{x^2y^{-5}}}$ **19.** $\sqrt{\dfrac{9x^{-2}y^6}{45x^{-7}y^2}}$ **20.** $\sqrt{\dfrac{33x^2y^6}{9x^{-3}}}$

Find the value of the algebraic expression at the specified values of its variable or variables in simplified form without a calculator. Simplify the expression before evaluating. Check your answer using a calculator.

21. $\sqrt{x^3y^4}$; $x=3, y=2$ **22.** $\sqrt{x^3y^5}$; $x=4, y=7$

23. $\sqrt{44x^5}$; $x=7$ **24.** $\sqrt{98x^6}$; $x=2$

25. $\sqrt{\dfrac{18x^5}{2x^{-2}}}$; $x=4$ **26.** $\sqrt{\dfrac{x^3y^{-4}}{x^7y^{-2}}}$; $x=3, y=5$

Exercise Set 3.3

Simplify the expression. Assume that all variables represent positive numbers.

1. $\sqrt[3]{8x^{11}}$ **2.** $\sqrt[3]{16x^7}$ **3.** $\sqrt[3]{40x^6y^5}$ **4.** $\sqrt[3]{72x^{10}y^5}$

5. $\sqrt[3]{\dfrac{48}{y^{12}}}$ **6.** $\sqrt[3]{\dfrac{64x^{25}}{y^8}}$ **7.** $\sqrt[3]{\dfrac{54x^{18}}{y^{27}}}$ **8.** $\sqrt[3]{\dfrac{32x^{28}}{27y^{15}}}$

Write each radical expression as an exponential expression and each exponential expression as a radical expression.

9. $\dfrac{1}{\sqrt{3}}$ **10.** $\sqrt[3]{7^2}$ **11.** $\sqrt{5^3}$ **12.** $\dfrac{1}{\sqrt[3]{x^7}}$

13. $x^{2/3}$ **14.** $7^{-5/2}$ **15.** $x^{3/5}$ **16.** $x^{-5/3}$

Evaluate each expression without a calculator. Check your answer using a calculator.

17. $\sqrt[3]{\dfrac{8}{27}}$ **18.** $\sqrt[3]{-64}$ **19.** $\sqrt[5]{32}$ **20.** $\sqrt[4]{\dfrac{1}{16}}$

21. $\sqrt[3]{-\dfrac{54}{2}}$ **22.** $\dfrac{\sqrt[3]{-27}}{\sqrt[3]{8}}$ **23.** $\dfrac{\sqrt[5]{-3}}{\sqrt[5]{96}}$ **24.** $\dfrac{\sqrt[3]{5}}{\sqrt[3]{40}}$

25. $8^{1/3}$ **26.** $64^{1/4}$ **27.** $(-32)^{1/5}$ **28.** $81^{1/2}$

Find the value of the algebraic expression at the specified values of its variable or variables without using a calculator. Check your answer using a calculator.

29. $x^{2/3}; \quad x=8$ **30.** $x^{3/4}; \quad x=16$

31. $(x^3y)^{1/2}; \quad x=2, y=4$ **32.** $x^{4/3}; \quad x=8$

33. $\left(\dfrac{x^4}{y^2}\right)^{3/2}; \quad x=2, y=3$ **34.** $(x^2-y)^{3/2}; \quad x=5, y=-7$

35. $(x^3+y^3)^{5/2}; \quad x=1, y=2$ **36.** $(xy^2)^{-2/3}; \quad x=2, y=-2$

37. $(x^2 + y^2)^{-1/2}$; $x = 3, y = 4$

38. $\left(\dfrac{x^2}{y^2}\right)^{-5/2}$; $x = 3, y = 2$