

## Exponents

Simplify the following:

$$1. x^3 \cdot x^5 = x^8$$

$$2. x^5 \cdot x^3 \cdot x^4 = x^{12}$$

$$3. x^2 y^5 \cdot x^5 y^6 = x^7 y^8$$

$$4. x^{\frac{2}{5}} \cdot x^{\frac{7}{5}} = x^{\frac{9}{5}}$$

$$5. y^{\frac{3}{4}} \cdot y^{\frac{1}{3}} = y^{\frac{9}{12}} \cdot y^{\frac{4}{12}} = y^{\frac{13}{12}}$$

$$6. 5^{3x} \cdot 5^{7x} = 5^{10x}$$

$$7. 3^y \cdot 3^x = 3^{y+x}$$

$$8. 3^x \cdot 5^x = 3^x \cdot 5^x$$

$$9. (x^2)^5 = x^{10}$$

$$10. (x^5 y^3)^4 = x^{20} y^{12}$$

$$11. (x^y)^3 = x^{3y}$$

$$12. (3^{2x})^x = 3^{3x^2}$$

$$13. (2^{x+1})^{x-1} = 2^{(x+1)(x-1)} = 2^{x^2-x+x-1} = 2^{x^2-1}$$

$$14. (x^{\frac{2}{5}})^{\frac{3}{4}} = x^{\frac{6}{20}}$$

$$15. (x^{\frac{2}{3}} y^{\frac{1}{2}})^{\frac{2}{5}} = x^{\frac{2}{3} \cdot \frac{2}{5}} y^{\frac{1}{2} \cdot \frac{2}{5}} = x^{\frac{4}{15}} y^{\frac{2}{5}}$$

$$16. 2^{3x^2-8x+1} \cdot 2^{5x^2+x+1} = 2^{3x^2-8x+1+5x^2+x+1} = 2^{8x^2-7x+2}$$

$$17. \frac{x^6}{x^4} = x^2$$

$$18. \frac{x^3}{x^5} = \frac{1}{x^2}$$

$$19. \frac{x^7 y^5}{x^4 y^6} = \frac{x^3}{y}$$

$$20. \frac{5^{2x-5}}{5^{x+3}} = 5^{(2x-5)-(x+3)} = 5^{2x-5-x-3} = 5^{x-8}$$

$$21. \frac{x^{\frac{2}{5}}}{x^{\frac{6}{5}}} = \frac{x^{\frac{4}{5}}}{x^{\frac{6}{5}}} = \frac{1}{x^{\frac{2}{5}}}$$

$$22. x^{-5} = \frac{1}{x^5}$$

$$23. (x^2 - 3x + 7)^0 = 1$$

$$24. 5^2 \cdot 5^0 \cdot 5^3 = 5^5$$

$$25. \frac{2x^{-3}}{-3y^{-2}} = -\frac{2y^2}{3x^3}$$

$$26. (3x^{-2}y^4)^{-3} = 3^{-3}x^6y^{-12} = \frac{x^6}{3^3y^{12}}$$

$$27. \frac{3x^{-2}y^5}{2x^{-5}y^3} = \frac{3x^5y^5}{2x^2y^3} = \frac{3x^3y^3}{2}$$

$$28. \frac{(6x^{-2}y)^3 (2x^4y^{-1})^{-4}}{(3x^{-5}y^4)^2} = \frac{2^3 \cdot 3^3 x^{-6} y^3 2^{-4} x^{-16} y^4}{3^2 x^{-10} y^8} = \frac{2^3 \cdot 3^3 x^{10} y^3 y^4}{2^4 3^2 x^{16} y^8} = \frac{3}{2x^{12}y}$$

$$29. \frac{2x^{\frac{1}{3}}y^{\frac{1}{2}}\left(4x^{\frac{1}{4}}y^{\frac{2}{3}}\right)^2}{\left(8x^{\frac{1}{2}}y^{\frac{3}{4}}\right)^3} = \frac{2x^{\frac{1}{3}}y^{\frac{1}{2}}2^4x^{\frac{2}{4}}y^{\frac{4}{3}}}{2^9x^{\frac{3}{2}}y^{\frac{9}{4}}} = \frac{2^{\frac{12}{12}}x^{\frac{4}{12}}y^{\frac{6}{12}}2^{\frac{48}{12}}x^{\frac{6}{12}}y^{\frac{16}{12}}}{2^{\frac{108}{12}}x^{\frac{18}{12}}y^{\frac{27}{12}}} = \frac{2^{\frac{60}{12}}x^{\frac{10}{12}}y^{\frac{22}{12}}}{2^{\frac{108}{12}}x^{\frac{18}{12}}y^{\frac{27}{12}}} = \frac{1}{2^{\frac{48}{12}}x^{\frac{8}{12}}y^{\frac{5}{12}}}$$

$$30. \left(x^2\left(x^3y^4\left(y^5\right)^4\right)^3\right)^{\frac{2}{3}} = \left(x^2\left(x^3y^4y^{20}\right)^3\right)^{\frac{2}{3}} = \left(x^2\left(x^3y^{24}\right)^3\right)^{\frac{2}{3}} = \left(x^2x^9y^{72}\right)^{\frac{2}{3}} = \left(x^{11}y^{72}\right)^{\frac{2}{3}} = x^{\frac{22}{3}}y^{\frac{144}{3}}$$