

Manipulating Powers

1) $(a^x)^y = a^{xy}$

4) $(ab)^x = a^x b^x$

7) $\frac{1}{a^{-x}} = a^x$

2) $a^x \cdot a^y = a^{x+y}$

5) $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

3) $\frac{a^x}{a^y} = a^{x-y}$

6) $a^{-x} = \frac{1}{a^x}$

Simplify each expression.

Example: $(x^2)^4 = x^{2 \cdot 4} = x^8$

1. $x^4 \cdot x^2$

2. $\frac{x^8}{x^6}$

3. $(x^2 y)^3$

4. $\left(\frac{x}{y^3}\right)^5$

5. y^{-15}

6. $\frac{1}{x^{-15}}$

7. $\frac{a^6}{a^9}$

8. $(2c^2)^3$

9. $\frac{n^4 \cdot n^6}{n^8 \cdot n^2}$

10. $4a^5 \cdot 3a^3$

11. $\left(\frac{v}{3}\right)^4 \cdot \left(\frac{5}{v}\right)^2$

12. $(x^{-2})^2$

13. $\left(\frac{2}{x}\right)^{-1}$

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14. $(x^{-2} \cdot y)^{-3}$

15. $\frac{12x^5}{3x^7}$

16. $\frac{8d}{(10d^4)(9d^2)}$

17. $2x^{-2}$

18. $x^{1/3} \cdot x^{2/3}$

19. $\left(\frac{8x}{125}\right)^{-2}$

20. $\frac{a^4 \cdot b^6 \cdot a^9}{b^{-2}}$

21. $\frac{x^{-4}y^{-6}}{x^2y^5z}$

22. $\left(\frac{x^2}{(xz)^2}\right)^{-2}$

23. $\left(\frac{x^2y^1z}{a^4b^{-7}}\right)^{-3}$

24. $(x^2y^2)^{-2} \cdot x^4y^{19}$

25. $\left(\frac{x^{-4}}{y^6}\right)^3 \cdot \left(\frac{x}{y^{-4}}\right)^{-4}$

26. $(a^2b^1c^8)^6 \cdot a^{-9} \cdot b^4 \cdot x$

27. $\left(\frac{x^{-4}b^{-1}}{4}\right)^{-3} \cdot 2x^5$

28. $(a^9b^{-2}c^1)^{-4} \cdot \left(\frac{ab}{x}\right)^3$

29. $\left(\frac{x^{-4}y^{-6}z^{10}}{a^1b^2c^{-4}}\right)^{-2} \cdot \left(\frac{a^1bc^{-4}}{x^6y^9z^9}\right)^5$