

2.4 Multiplying : Dividing Powers

When powers have the same base we can simplify as a single power using exponent laws

Product of Powers

$$(4^3)(4^2) \rightarrow \underbrace{4 \times 4 \times 4}_{4^3} \times \underbrace{4 \times 4}_{4^2} = 4^5 \quad (4^{3+2})$$

Add exponents when powers with same base are multiplied

ex. Simplify (write as single power)

$$a) 5^6 \cdot 5^4 \quad 5^{6+4} = 5^{10} \quad b) (3^4)(3^{-2}) \quad 3^{4+(-2)} = 3^2$$

$$c) (x^4)(x^{-2})(x^1) \\ x^{4-2+1} = x^3$$

$$d) \left(\frac{1}{2}\right)^5 \left(\frac{1}{2}\right)^3 = \left(\frac{1}{2}\right)^{5+3} = \left(\frac{1}{2}\right)^8 = \left(\frac{1}{2}\right)^8 = \frac{1}{2^8} = \frac{1}{256}$$

Quotient of Powers

$$\frac{5^6}{5^2} = \frac{\underbrace{5 \times 5 \times 5 \times 5 \times 5 \times 5}_{5^6}}{\underbrace{5 \times 5}_{5^2}} = 5 \times 5 \times 5 \times 5 = 5^4 \quad (5^{6-2})$$

Subtract exponents if powers with the same base divide

ex. Simplify

$$a) \frac{x^8}{x^3} \quad x^{8-3} = x^5$$

$$b) \frac{3^7}{3^{-2}} \quad 3^{7-(-2)} = 3^9$$

$$c) 8^{-4} \div 8^{-7} \quad 8^{-4-(-7)} = 8^3$$

Power of Powers

$$(3^2)^3 \quad (3 \times 3)^3 = (3 \times 3)(3 \times 3)(3 \times 3) = 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6 \quad (3^{2 \cdot 3})$$

Multiply exponents when power is raised to another power

ex. Simplify

$$a) (y^3)^4 \quad y^{3 \cdot 4} = y^{12}$$

$$b) \left(\frac{1}{x^3}\right)^3 \quad \left(\frac{1}{x}\right)^{3 \cdot 3} = \left(\frac{1}{x}\right)^9 = \frac{1}{x^9}$$

$$c) \left(\frac{a^4}{b^2}\right)^3 \quad \frac{a^{12}}{b^6}$$

↑ NOT SAME BASE!

$$d) \left(\frac{x^5}{x^3} \right)^4 \left(x^{5-3} \right)^4 \left(x^2 \right)^4 = x^8$$

$$\frac{x^{20}}{x^{12}} = x^{20-12} = x^8$$

Pg 64 # 1-5 (a, c, e) 6, 12, 13, 16

Quiz Tomorrow 2.1-2.4