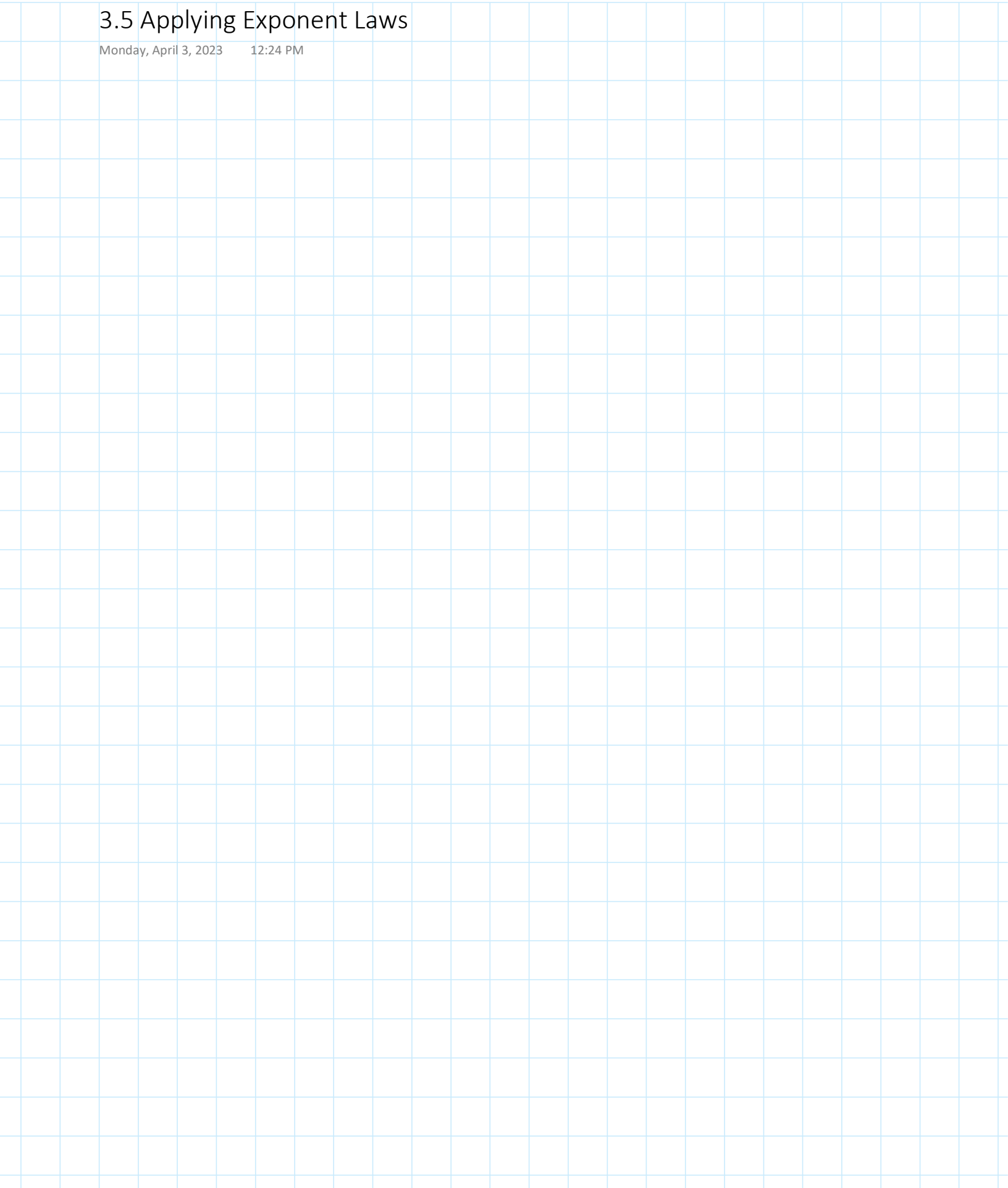


3.5 Applying Exponent Laws

Monday, April 3, 2023 12:24 PM





3.5 Applying Exponent Laws (Part 1)

Product Rule	$(x^a)(x^b) = x^{a+b}$	$5^2 \cdot 5^4 = 5^{2+4}$ $= 5^6$
Quotient Rule	$\frac{x^a}{x^b} = x^{a-b}$	$\frac{a^8}{a^3} = a^{8-3} = a^5$
Power Rule	$(x^a)^b = x^{a \cdot b}$ multiply exponents	$((-2)^3)^4 = (-2)^{3 \cdot 4} = (-2)^{12}$
Power of a Product Rule	$(xy)^a = x^a \cdot y^a$	$(3x^2)^3 = (3^3) \cdot (x^2)^3$ $= 3^3 x^6 = 27x^6$
Power of a Quotient Rule	$\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$	$\left(\frac{y}{2^2}\right)^3 = \frac{y^3}{2^6} = \frac{y^3}{64}$
Power of Zero Rule	$x^0 = 1$	$(2x^3y)^0 = 2^0 \cdot x^{3 \cdot 0} \cdot y^{1 \cdot 0} = 1$
Negative Exponents	$x^{-a} = \frac{1}{x^a}$	$5^{-2} = \frac{1}{5^2} = \frac{1}{25}$ $\left(\frac{4}{5}\right)^{-2} = \left(\frac{5}{4}\right)^2 = \frac{25}{16}$

$$16^{-\frac{1}{2}} = \frac{1}{16^{\frac{1}{2}}} = \left(\sqrt[2]{16}\right)^{-1} = \frac{1}{4}$$

*When simplifying exponential expressions, all answers must be left with **positive exponents** only.

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Example 1: Simplify

$$\begin{aligned} \text{a) } 7^3 \times 7^5 & \\ &= 7^{3+5} \\ &= 7^8 \end{aligned}$$

$$\begin{aligned} \text{b) } \left[\left(-\frac{3}{2} \right)^{-4} \right]^2 &\times \left[\left(-\frac{3}{2} \right)^2 \right]^3 \\ &= \left(-\frac{3}{2} \right)^{-8} \times \left(-\frac{3}{2} \right)^6 \\ &= \left(-\frac{3}{2} \right)^{-8+6} = \left(-\frac{3}{2} \right)^{-2} = \left(\frac{-2}{3} \right)^2 \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{(1.4)^3 (1.4)^4}{(1.4)^{-2}} & \\ \frac{(1.4)^{3+4}}{(1.4)^{-2}} &= \frac{(1.4)^7}{(1.4)^{-2}} = (1.4)^{7-(-2)} \\ &= (1.4)^9 \end{aligned}$$

$$\begin{aligned} \text{d) } x^3 \cdot x^{-5} & \\ &= x^{3+(-5)} \\ &= x^{-2} \\ &= \frac{1}{x^2} \end{aligned}$$

$$\begin{aligned} \text{e) } (x^3 y^2)(x^2 y^{-4}) & \\ &= x^3 \cdot x^2 \cdot y^2 \cdot y^{-4} \\ &= x^{3+2} \cdot y^{2+(-4)} \\ &= x^5 y^{-2} = \frac{x^5}{y^2} \end{aligned}$$

$$\begin{aligned} \text{f) } \frac{10a^5 b^3}{2a^2 b^{-2}} &= \frac{10}{2} \cdot \frac{a^5}{a^2} \cdot \frac{b^3}{b^{-2}} \\ &= 5a^{5-2} b^{3-(-2)} \\ &= 5a^3 b^5 \end{aligned}$$

$$\begin{aligned} \text{g) } (x^4)^{-3} & \\ &= x^{4 \cdot (-3)} \\ &= x^{-12} \\ &= \frac{1}{x^{12}} \end{aligned}$$

$$\begin{aligned} \text{h) } \frac{100a}{25a^5 b^{-1/2}} &= \frac{100}{25} \frac{a^1}{a^5} \frac{b^{-1/2}}{b^{-1/2}} \\ &= 4a^{1-5} b^{1/2} \\ &= 4a^{-4} b^{1/2} = \frac{4b^{1/2}}{a^4} \\ & \text{or } \frac{4\sqrt{b}}{a^4} \end{aligned}$$

Practice: p. 241 #3-11, 14

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