

### 4.6 Applying Exponent Laws

Recall again:  $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

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

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

ex.  $\left(\frac{2}{5}\right)^2 = \frac{2^2}{5^2} = \frac{4}{25}$

$\sqrt{\frac{2}{5}} = \frac{\sqrt{2}}{\sqrt{5}}$

ex.  $(2x)^3 = 2^3 x^3 = 8x^3$

$\sqrt[5]{2x} = \sqrt[5]{2} \cdot \sqrt[5]{x}$

ex. Simplify then evaluate if  $a = -3$  &  $b = 2$

$$\begin{aligned} \left(\frac{a^6 b^9}{a^5 b^8}\right)^{-2} &= \left(\frac{a^5 b^8}{a^6 b^9}\right)^2 \\ &= (a^{5-6} b^{8-9})^2 \\ &= (a^{-1} b^{-1})^2 \\ &= \left(\frac{1}{ab}\right)^2 = \frac{1}{a^2 b^2} \end{aligned}$$

$$\begin{aligned} &= \frac{1}{(-3)^2 (2)^2} \\ &= \frac{1}{(9)(4)} \\ &= \frac{1}{36} \end{aligned}$$

ex. Simplify as a single power

a)  $\left[\left(\frac{-3}{2}\right)^{-4}\right]^2 \cdot \left[\left(\frac{-3}{2}\right)^2\right]^3$

$$\begin{aligned} &= \left(\frac{-3}{2}\right)^{-8} \cdot \left(\frac{-3}{2}\right)^6 \\ &= \left(\frac{-3}{2}\right)^{-8+6} \\ &= \left(\frac{-3}{2}\right)^{-2} = \left(\frac{2}{-3}\right)^2 \end{aligned}$$

c)  $\frac{(1.4)^3 (1.4)^4}{(1.4)^{-2}}$

$$\begin{aligned} &= \frac{(1.4)^7}{(1.4)^{-2}} \\ &= 1.4^{7-(-2)} \\ &= 1.4^9 \end{aligned}$$

b)  $\left(\frac{7^{-2/3}}{7^{1/3} \cdot 7^{5/3}}\right)^6 = \left(\frac{7^{-2/3}}{7^2}\right)^6$

$\frac{2}{3} - \frac{2+5}{3} = \frac{2}{3} - \frac{7}{3} = -\frac{5}{3}$

$= (7^{-5/3})^6 = 7^{-10}$

$= \frac{1}{7^{10}}$

$\frac{1}{3} + \frac{5}{3} = \frac{6}{3} = 2$

$\frac{4}{3} \times \frac{6}{1} = \frac{24}{3} = 8$

$\frac{5^3}{5^{-2}} = 5^5$

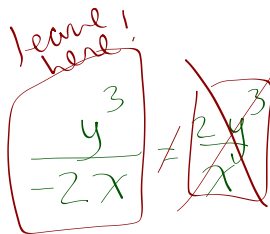
$\frac{5^{-5}}{5^2} = \frac{1}{5^7}$

$5^{-5-2} = 5^{-7} = \frac{1}{5^7}$

ex. Simplify

a)  $(x^3y^2)(x^2y^4)$   
 $= x^{3+2} y^{2+4}$   
 $= x^5 y^6$   
 $= \frac{x^5}{y^2}$

b)  $\frac{6x^3y^3}{74xy^2}$   
 $= \frac{3x^2y}{7}$   
 $= \frac{3x^2y^{-5}}{7}$   
 $= \frac{3x^2}{7y^5}$



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

d)  $\frac{4a^{-2}b^{2/3}}{2a^2b^{1/3}}$   
 $= \frac{2a^{-2-2}b^{2/3-1/3}}{1}$   
 $= \frac{2a^{-4}b^{1/3}}{1}$   
 $= \frac{2b^{1/3}}{a^4}$

e)  $\left(\frac{100a^4}{25a^5b^{-1/2}}\right)^{1/2} = \left(\frac{4a^{-1}b^{1/2}}{b^{-1/2}}\right)^{1/2}$   
 $= \left(\frac{4a^{-1}b^{1/2}}{b^{-1/2}}\right)^{1/2} = \left(\frac{4b^{1/2}}{a^1}\right)^{1/2} = \frac{4^{1/2}b^{1/4}}{a^2} = \boxed{\frac{2b^{1/4}}{a^2}}$

ex. A sphere has a volume of  $425 \text{ m}^3$ . What is the radius of the sphere to the nearest tenth of a meter?

$V = \frac{4}{3}\pi r^3$   
 $\left(\frac{3}{4}\right)425 = \left(\frac{3}{4}\right)\frac{4}{3}\pi r^3$   
 $3\sqrt[3]{\frac{3(425)}{4\pi}} = 3\sqrt[3]{\frac{\pi r^3}{\pi}}$   
 $3\sqrt[3]{101.46} = 3\sqrt[3]{r^3}$   
 $r = 4.664 \text{ m}$

homefun: pg. 241 #(3-11)aceg, 12-16, 21-23

∴ The radius is about 4.7 m