KEY

L09 - Chapter 4 Review

1. Simplify each expression.

a) $(x^8)(x^8)(x^8)$ x^{24}

b) $(x^6)(x)(x^3)$ x^{10}

c) $(-2a)(-a^5b)(a^3b^7)$ $2a^9b^8$

d) $(7x^7y^5)(-2x^4y^8)$ $-14x^{11}y^{13}$

e) $(xyz^5)(x^5y^8z)$ $x^6y^9z^6$

f) $(2^5)(2^8)(2^3)$ 2^{16}

g) $(-7a^7b^6)(2a^5b)$ $-14a^{12}b^7$

h) $(4x^6y)(\frac{1}{2}x^7y^8)$ $2x^{13}y^9$

i) $(-3xy^5z^6)(xyz^7)$ $-3x^2y^6z^{13}$

2. Simplify each expression.

a) $\frac{a^8b^4c^3}{a^5b^3c} = a^3bc^2$

b) $\frac{a^9b}{ab} = a^8$

c) $\frac{a^8b^{10}}{a^2b^6} = a^6b^4$

d) $\frac{6a^2b}{-ab} = -6a$

e) $\frac{-72a^3b^8}{-8ab^6} = 9a^2b^2$

g) $\frac{-54a^6b^4}{9a^3b} = -6a^3b^3$

3. Evaluate each expression.

a) $\frac{(4)^5(4)^8(4)^{10}}{(4)^6(4)^{15}} = 4^2$ (or 2^4)

b) $\frac{(10)^{10}(10)^{100}}{(10)^{108}} = 10^2$

c) $\frac{(-2)^8(-2)^9(-2)^{12}}{(-2)^3(-2)^6(-2)^{11}}$ $(-2)^9$

d) $\frac{(7)^2(7)^3(7)^{10}}{(7)^{14}}$ 7^1 or 7

4. Simplify each of the following as far as possible. Leave your answer with positive exponents.

a) $(a^2b^4)(a^2b^{-5})$ $a^4b^{-1} = \frac{a^4}{b}$

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

c) $\frac{x^2y^{-2}}{y^{-1}} = \frac{x^2y^1}{y^2} = \frac{x^2}{y}$

d) $(x^3y^2)(x^2y^3)$ x^5y^5

e) $(x^{-1}y^{-2})(x^{-2}y^{-3})$ $x^{-3}y^{-5} = \frac{1}{x^3y^5}$

f) $\frac{x^{-3}y^{-2}}{x^2y^{-6}} = \frac{y^6}{x^2x^3y^2} = \frac{y^6}{x^5y^2}$ $= \frac{y^4}{x^5}$

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5. Use the laws of exponents to simplify. Leave your answers with positive exponents.

a) $5^{\frac{3}{4}} \times 5^{\frac{1}{8}} = 5^{7/8}$

b) $\dfrac{3^{\frac{5}{8}}}{3^{-\frac{1}{8}}}$ $3^{6/8} = 3^{3/4}$

c) $\left(10^{\frac{3}{5}}\right)^{\frac{2}{5}} = 10^{6/25}$

d) $a^{\frac{2}{3}} \times a^{\frac{5}{4}}$ $a^{8/12} a^{15/12} = a^{23/12}$

e) $\left(27^{-\frac{2}{3}}\right)^{\frac{3}{2}} = 27^{-6/6} = 27^{-1}$ $\left(\text{or } 3^{-3}\right)$

f) $\left(m^{\frac{2}{3}} n^{-\frac{1}{4}}\right)^{\frac{1}{2}}$ $m^{2/6}\ n^{-1/8}$ $= m^{1/3} n^{-1/8}$

6. Express each power as an equivalent radical.

a) $2^{\frac{1}{3}} = \sqrt[3]{2}$

b) $x^{\frac{1}{2}} = \sqrt{x}$

c) $7^{-\frac{1}{2}} = \frac{1}{7^{1/2}} = \frac{1}{\sqrt{7}}$

d) $x^{-\frac{3}{7}} = \frac{1}{x^{3/7}} = \frac{1}{\sqrt[7]{x^3}}$

e) $(3x)^{\frac{1}{2}} = \sqrt{3x}$

f) $3x^{\frac{1}{2}} = 3\sqrt{x}$

7. Express each radical as a power.

a) $\sqrt{7} = 7^{1/2}$

b) $\sqrt[3]{-11} = (-11)^{1/3}$

c) $\sqrt[3]{6^4} = 6^{4/3}$

d) $\dfrac{1}{\left(\sqrt[5]{x}\right)^4} = \dfrac{1}{x^{4/5}}$

e) $\sqrt[3]{2b^3} = (2b^3)^{1/3}$ $= 2^{1/3} b$

f) $\sqrt[n]{27} = 27^{1/n}$ $\left(\text{or } 3^{3/n}\right)$

8. Express each mixed radical as an equivalent entire radical.

a) $3\sqrt{2} = \sqrt{18}$

b) $-4\sqrt{3} = -\sqrt{48}$

c) $5\sqrt{27} = \sqrt{675}$

d) $6\sqrt{8} = \sqrt{288}$

e) $2\sqrt[3]{3} = \sqrt[3]{24}$

f) $2\sqrt[4]{27} = \sqrt[4]{432}$

9. Express each entire radical as an equivalent mixed radical.

a) $\sqrt{32} = 4\sqrt{2}$

b) $\sqrt{48} = 4\sqrt{3}$

c) $-3\sqrt{27} = -9\sqrt{3}$

d) $-6\sqrt{150}$ $= -30\sqrt{6}$

e) $\sqrt[3]{128}$ $\sqrt[3]{8 \cdot 8 \cdot 2}$ $4\sqrt[3]{2}$

f) $3\sqrt[3]{135}$ $3\sqrt[3]{27 \cdot 5}$ $9\sqrt[3]{5}$

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10. (Fictional scenario) Unknowingly a new viral strain was introduced into the town of Stettler by one infected person. Every 3 days the number of infected people doubles.

a. Fill in the table below for the number of infected people after 21 days.

Time (days)	Number of Infected
0	1
3	2
6	4
9	8
12	16
15	32
18	64
21	128

b. Write an equation that represents the rate of infection.

$y = ab^{x/t}$

$y = (1)(2)^{x/3}$

c. Using your equation from ***b.*** show many people are infected:

i. After 1 month ~30 days

$y = (1)(2)^{30/3}$

$= (1)(2)^{10}$

$= 1024$

1024 people infected

ii. After 1 year 365 days

$y = (1)(2)^{365/3}$

$= (1)(2)^{121.\bar{6}}$

$= 4.22 \times 10^{36}$ people infected

d. Using a calculator, how long would it take for the population of Stettler (approx. 5700 people) to become infected? The world (approx. 7 billion)? GUESS + TEST

Town

$y = (1)(2)^{x/3}$

$5700 = (1)(2)^{x/3}$

$x \approx 37.5$ days

World

$y = (1)(2)^{x/3}$

$7{,}000{,}000{,}000 = (1)(2)^{x/3}$

$x \approx 98$ days

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11. The following is the mass of Sodium-24, in grams, after 105 hours.

a. At what rate is the Sodium-24 decaying? How often does this occur?

Halving every 15 hours

Time (hours)	Mass of Sodium-24
0	2000
15	1000
30	500
45	250
60	125
75	62.5
90	31.25
105	15.625

b. Write an equation that represents the decay of the Sodium-24.

$y = ab^{x/t}$

$y = (2000)(0.5)^{x/15}$

c. Using your calculator, calculate the mass of Sodium-24 after 225 hours.

$y = (2000)(0.5)^{225/15}$

$y = (2000)(0.5)^{15}$

$y = 0.061\ g$

d. At what time, after 0 hours, is the mass of Sodium-24 0.150 grams?

$0.150 = 2000\ (0.5)^{x/15}$

$0.000075 = (0.5)^{x/15}$

$0.5^{8} = 0.0039$

$0.5^{12} = 0.000244$

$0.5^{14} = 0.000061$

So exponent ≈ 14

$x \approx 210$ hours.