Week 1

Section 1.2

HW1: 10, 12, 16, 18, 22, 24, 26, 30, 32, 34, 36, 42, 46, 50, 56, 64, 72, 74, 80, 84 (p. 22-23)

Laws of Exponents	
$a^m \cdot a^n = a^{m+n}$	$(ab)^n = a^n b^n$
$\frac{a^m}{a^n} = a^{m-n}$	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$
$(a^m)^n = a^{m \cdot n}$	$a^{-n} = \frac{1}{a^n}$
$a^0 = 1$	$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$

$1^2 = 1$ $2^2 = 4$ $3^2 = 9$ $4^2 = 16$ $5^2 = 25$ $6^2 = 36$ $7^2 = 49$ $8^2 = 64$ $9^2 = 81$ $10^2 = 100$	$1^3 = 1$ $2^3 = 8$ $3^3 = 27$ $4^3 = 64$ $5^3 = 125$ $6^3 = 216$ $7^3 = 343$	$1^4 = 1$ $2^4 = 16$ $3^4 = 81$ $4^4 = 256$ $5^4 = 625$

Review Exercises

Write the radical expression using exponents.

$$\sqrt[9]{5^2}$$

Solution

$$\sqrt[9]{5^2} = 5^{\frac{2}{5}}$$

Write the exponential expression using radicals.

$$6^{-\frac{2}{5}}$$

Solution

$$6^{-\frac{2}{5}} = \frac{1}{6^{\frac{2}{5}}} = \frac{1}{\sqrt[5]{6^2}}$$

Evaluate the expression.

$(-4)^3$ $= (-4)(-4)(-4)$ $= -64$	-4^3 $= -4 \cdot 4 \cdot 4$ $= -64$	$(-4)^3 \cdot \left(\frac{3}{-4}\right)^3$ $= -64 \cdot \frac{27}{-64}$ $= 27$

Evaluate the expression.

$2^{10} \cdot 2^5$ $= 2^{10+5}$ $= 2^{15}$	$\frac{10^{12}}{10^{10}}$ $= 10^{12-10}$ $= 10^2$ $= 100$	$(4^3)^{12}$ $= 4^{36}$

Evaluate the expression.

$5\sqrt[3]{250}$ $= 5\sqrt[3]{125 \cdot 2}$ $= 5 \cdot 5\sqrt[3]{2}$ $= 25\sqrt[3]{2}$	$\frac{\sqrt{32}}{\sqrt{49}}$ $= \frac{\sqrt{16 \cdot 2}}{7}$ $= \frac{4\sqrt{2}}{7}$	$\sqrt{\frac{12}{25}}$ $= \frac{\sqrt{4 \cdot 3}}{5}$ $= \frac{2\sqrt{3}}{5}$

Evaluate the expression.

$\sqrt{3}\sqrt{15}$ $= \sqrt{45}$ $= \sqrt{9 \cdot 5}$ $= 3\sqrt{5}$	$\frac{\sqrt{48}}{\sqrt{3}}$ $= \frac{\sqrt{16 \cdot 3}}{\sqrt{3}}$ $= \frac{4\sqrt{3}}{\sqrt{3}}$ $= 4$	$\sqrt[3]{24}\sqrt[3]{18}$ $= \sqrt[3]{24 \cdot 18}$ $= \sqrt[3]{432}$ $= \sqrt[3]{216 \cdot 2}$ $= 6\sqrt[3]{2}$

Simplify the expression and eliminate any negative exponents.

$x^3 \cdot x^5$ $= x^{3+5}$ $= x^8$	$(5x)^3$ $= 125x^3$	$x^7 x^{-3}$ $= x^{7+(-3)}$ $= x^4$

Simplify the expression and eliminate any negative exponents.

$x^4 \cdot x^{-5}$ $= x^{4+(-5)}$ $= x^{-1}$ $= \frac{1}{x}$	$x^3 x^{-7} x^{-2}$ $= x^{3+(-7)+(-2)}$ $= x^{-6}$ $= \frac{1}{x^6}$	$\frac{x^3 x^0}{x^{10}}$ $= \frac{x^3 \cdot 1}{x^{10}}$ $= x^{3-10}$ $= x^{-7}$ $= \frac{1}{x^7}$

Simplify the expression and eliminate any negative exponents.

$\frac{x^9 x^5}{x^7 x^4}$ $= \frac{x^{14}}{x^{11}}$ $= x^{14-11}$ $= x^3$	$(3x^3 x^4)^4$ $= (3x^7)^4$ $= 81x^{28}$	$(-2x^3)^4 (5x^2)$ $= 16x^{12} \cdot 5x^2$ $= 80x^{12+2}$ $= 80x^{14}$

Simplify the expression and eliminate any negative exponents.

$(6m^{-3}n^5)(\frac{1}{3}n^{-3})$ $= 2m^{-3}n^2$ $= \frac{2n^2}{m^3}$	$(4a^4 b^{-2})^3 (a^5 b^{-1})$ $= 64a^{12} b^{-6} a^5 b^{-1}$ $= 64a^{17} b^{-7}$ $= \frac{64a^{17}}{b^7}$

Simplify the expression and eliminate any negative exponents.

$$\frac{4x^3y^{-1}}{x^{-7}y^{-5}}$$

$$= 4x^{3-(-7)}y^{-1-(-5)}$$

$$= 4x^{10}y^4$$

$$\left(\frac{5x^{-2}y^2}{x^4y^{-7}}\right)^{-2}$$

$$= (5x^{-6}y^9)^{-2}$$

$$= 5^{-2}x^{12}y^{-18}$$

$$= \frac{x^{12}}{5^2y^{18}}$$

$$= \frac{x^{12}}{25y^{18}}$$

Simplify the expression.

$$\sqrt[4]{x^{12}}$$

$$= x^3$$

$$\sqrt[3]{x^{12}y^6}$$

$$= x^4y^2$$

Simplify the expression.

$$\sqrt{32} + \sqrt{18}$$

$$= \sqrt{16 \cdot 2} + \sqrt{9 \cdot 2}$$

$$= 4\sqrt{2} + 3\sqrt{2}$$

$$= 7\sqrt{2}$$

$$\sqrt[3]{128} - \sqrt[3]{54}$$

$$= \sqrt[3]{64 \cdot 2} - \sqrt[3]{27 \cdot 2}$$

$$= 4\sqrt[3]{2} - 3\sqrt[3]{2}$$

$$= \sqrt[3]{2}$$

Evaluate the expression.

$16^{\frac{1}{4}}$ $= \sqrt[4]{16}$ $= 2$	$(-27)^{\frac{1}{3}}$ $= \sqrt[3]{-27}$ $= -3$	$-\left(\frac{1}{16}\right)^{\frac{1}{4}}$ $= -\sqrt[4]{\frac{1}{16}}$ $= -\frac{1}{2}$

Simplify the expression.

$(27x^3)^{-\frac{2}{3}}$ $= \frac{1}{(27x^3)^{\frac{2}{3}}}$ $= \frac{1}{\sqrt[3]{(27x^3)^2}}$ $= \frac{1}{\left(\sqrt[3]{27x^3}\right)^2}$ $= \frac{1}{(3x)^2}$ $= \frac{1}{9x^2}$	$(u^3v^5)^{-\frac{1}{3}}$ $= \frac{1}{(u^3v^5)^{\frac{1}{3}}}$ $= \frac{1}{\sqrt[3]{u^3v^5}}$ $= \frac{1}{uv^{\frac{5}{3}}}$

Simplify the expression, and eliminate the negative exponents.

$\sqrt{x^7}$ $= x^{\frac{7}{2}}$	$\sqrt[4]{x^{10}}$ $= x^{\frac{10}{4}}$ $= x^{\frac{5}{2}}$

Simplify the expression, and eliminate the negative exponents.

$\sqrt[5]{b^2}\sqrt{b}$ $= b^{\frac{2}{5}} \cdot b^{\frac{1}{2}}$ $= b^{\frac{2}{5}+\frac{1}{2}}$ $= b^{\frac{4}{10}+\frac{5}{10}}$ $= b^{\frac{9}{10}}$	$3\sqrt{a}\sqrt[4]{a^3}$ $= 3a^{\frac{1}{2}} \cdot a^{\frac{3}{4}}$ $= 3a^{\frac{1}{2}+\frac{3}{4}}$ $= 3a^{\frac{2}{4}+\frac{3}{4}}$ $= 3a^{\frac{5}{4}}$

Put the fractional expression into standard form by rationalizing the denominator.

$\frac{15}{\sqrt{5}}$ $= \frac{15 \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}}$ $= \frac{15\sqrt{5}}{5}$ $= 3\sqrt{5}$	$\sqrt{\frac{8}{5}}$ $= \frac{\sqrt{8} \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}}$ $= \frac{\sqrt{4 \cdot 2} \cdot \sqrt{5}}{5}$ $= \frac{2\sqrt{10}}{5}$	$\frac{7}{\sqrt[3]{3^2}}$ $= \frac{7\sqrt[3]{3}}{\sqrt[3]{3^2}\sqrt[3]{3}}$ $= \frac{7\sqrt[3]{3}}{3}$

Write each number in scientific notation.

$$234,500,000 = 2.345 \times 10^{8}$$

$$5,479,000,000 = 5.479 \times 10^{9}$$

$$0.00023 = 2.3 \times 10^{-4}$$

$$0.000005066 = 5.066 \times 10^{-6}$$