Exponent Laws Part 2

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A. Exponent Laws

   4) Negative Exponent Law

$$a^{-m} = \frac{1}{a^m}$$

$$\frac{1}{a^m}$$

a) 4^{-2} $= \dfrac{1}{4^2} = \boxed{\dfrac{1}{16}}$

b) -2^{-4} $= \dfrac{-1}{2^4} = \boxed{\dfrac{-1}{16}}$

c) $\left(\dfrac{2}{5}\right)^{-2} = \dfrac{(2)^{-2}}{(5)^{-2}} = \dfrac{(5)^2}{(2)^2} = \boxed{\dfrac{25}{4}}$

d) $m^{-3}n^2$ $= \boxed{\dfrac{n^2}{m^3}}$

5) <u>Power of Powers Law</u>

$$\boxed{\left(a^m\right)^n = a^{mn}}$$

a) $\left(3^2\right)^4$ $=$ $3^{2\cdot4}$ $=$ $\boxed{3^8}$

b) $\left(x^3\right)^4$ $=$ $x^{3\cdot4}$ $=$ $\boxed{x^{12}}$

c) $\left(m^{-3}\right)^{-2}$ $=$ $m^{-3\cdot-2}$ $=$ $\boxed{m^6}$

d) $\left(y^{-4}\right)^2$ $=$ $y^{-4\cdot2}$ $=$ y^{-8} $=$ $\boxed{\dfrac{1}{y^8}}$

e) $\left(n^{-\frac{3}{2}}\right)^{-\frac{4}{3}}$ $=$ $n^{\frac{-1}{2}\times\frac{-2}{3}}$ $=$ $\boxed{n^2}$

6) Power of Product Law

$$(ab)^m = a^m b^m \quad \text{or} \quad \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$

a) $(3m)^3 = 3^3 m^3 = \boxed{27m^3}$

b) $\left(-6a^3b\right)^2 = (-6)^2 a^{3\cdot2} b^2 = \boxed{36a^6b^2}$

c) $\left(\frac{3m}{4n}\right)^2 = \frac{3^2 m^2}{4^2 n^2} = \boxed{\frac{9m^2}{16n^2}}$

B. Practice Questions

1) Evaluate the following.

a) $\left(2^2\right)^3$

$(2)^{2\cdot3} = (2)^6$

$= \boxed{64}$

b) $-3^{-3} = \dfrac{-1}{3^3}$

$= \boxed{\dfrac{-1}{27}}$

c) $\left(4^4\right)^{\frac{1}{2}} = (4)^{4\cdot-\frac{1}{2}}$

$= (4)^{-2} = \dfrac{1}{(4)^2}$

$= \boxed{\dfrac{1}{16}}$

2) Simplify the following.

a) $\left(5xy^3\right)^2$

$= 5^2 x^2 y^{3\cdot2}$

$= \boxed{25x^2 y^6}$

b) $\left(\dfrac{2m^{-2}}{n^{-3}}\right)^{-4} = \dfrac{(2)^{-4} m^{-2\cdot-4}}{n^{-3\cdot-4}}$

$= \dfrac{(2)^{-4} m^8}{n^{12}} = \dfrac{m^8}{(2)^4 n^{12}} = \boxed{\dfrac{m^8}{16n^{12}}}$

c) $\left(6a^{\frac{1}{2}}b^3\right)^2 = (6)^2 a^{\frac{1}{2}\cdot2} b^{3\cdot2}$

$= \boxed{36ab^6}$

Assignment: Exponent Laws Part 2 Assignment

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1. Evaluate the following.

a) $(-2)^3 \times (-2)^3$

b) $\left(-\frac{1}{4}\right)^{-6} \div \left(-\frac{1}{4}\right)^9$

c) 5^{-2}

d) $\left(3^{-1}\right)^3$

e) $\left(5^{-\frac{4}{5}}\right)^{-\frac{5}{2}}$

f) $4^{-3} \times 4^{-2} \div 4^{-8}$

g) $6^{-5} \times 6^3$

h) $8^7 \div 8^7$

i) $\left(\frac{3}{4}\right)^3 \times \left(\frac{3}{4}\right)^{-5}$

j) $\frac{2^{-2}}{2^{-6}}$

k) $-(3)^2(3)(3)^{-4}$

l) $\left(\frac{2^3}{3}\right)^{-2}$

2. Simplify the following. Do not leave any negative exponents.

a) $\left(x^2 y\right)\left(x^3 y\right)$

b) $\dfrac{m^5 n^4}{mn^2}$

c) $\left(2x^3 y\right)^3$

d) $\left(a^{-1} b^2\right)^{-3}$

e) $\left(m^4 n^6\right)^{-\frac{1}{2}}$

f) $\left(\dfrac{x^3}{y^2}\right)^{-1}$

g) $\left(3m^{-1} n\right)^2$

h) $\left(x^2 y^{-2}\right)\left(xy^{-3}\right)$

i) $\dfrac{a^{-1} b}{a^{-3} b^4}$

j) $\left(m^{\frac{3}{2}}\right)^{-2}$

k) $\left(\dfrac{3x^{-1}}{y^2}\right)^{-2}$

l) $\dfrac{x^2 y^{-2}}{x^4 y^{-2}}$

Answers

1. a) 64

    b) $-\dfrac{1}{64}$

    c) $\dfrac{1}{25}$

    d) $\dfrac{1}{27}$

    e) 25

    f) 64

    g) $\dfrac{1}{36}$

    h) 1

    i) $\dfrac{16}{9}$

    j) 16

    k) $-\dfrac{1}{3}$

    l) $\dfrac{9}{64}$

2. a) $x^5 y^2$

    b) $m^4 n^2$

    c) $8x^9 y^3$

    d) $\dfrac{a^3}{b^6}$

    e) $\dfrac{1}{m^2 n^3}$

    f) $\dfrac{y^2}{x^3}$

    g) $\dfrac{9n^2}{m^2}$

    h) $\dfrac{x^3}{y^5}$

    i) $\dfrac{a^2}{b^3}$

    j) $\dfrac{1}{m^3}$

    k) $\dfrac{x^2}{9y^4}$

    l) $\dfrac{1}{x^2}$