LESSON 46 - RATIONAL EXPONENTS

Do Now.

Problem 1. Simplify the following. Assume variables represent positive real numbers.

(1) Evaluate $3a^0 + a^{-2}$ if $a = 4$.

(2) Write $\frac{\left(x^{-2}\right)^{-3}}{x^3y^6}$ without a denominator.

Problem 2. Consider the real number b. Express each of the following without a fractional exponent:

(1) $b^{\frac{1}{2}}$

(2) $b^{\frac{1}{3}}$

(3) $b^{\frac{2}{3}}$

(4) $b^{\frac{p}{q}}$

Problem 3. Simplify:

(1) $9^{\frac{1}{2}}$

(2) $(-8)^{\frac{1}{3}}$

(3) $25^{-\frac{3}{2}}$

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

(5) $\left(\frac{4}{9}\right)^{-\frac{1}{2}}$

(6) $\frac{12^0}{9^{-1.5}}$

(7) $9^{\frac{3}{2}} \cdot 9^{-\frac{1}{2}}$

(8) $-4^0 + 4^{-\frac{3}{2}}$

Problem 4. Johanes Kepler was a German mathematician and a key figure in the scientific revolution. His third law of planetary motion says that the period of orbit of a planet squared is equal to its average distance from the Sun cubed. If we let P be the period of the orbit and d the distance to the Sun, then Kepler's Third Law tells us that

$$P^2 = d^3$$

Suppose that d is measured in astronomical units, where 1 astronomical unit = 150,000,000 kilometers.

(1) If a planet has a period of 29.5 years, can you figure out its distance from the Sun? Can you guess which planet this is?
(2) The planet Neptune is 30.1 AU away from the Sun. Can you figure how long it takes for it orbit the Sun?