

3.2 NEGATIVE AND FRACTIONAL EXPONENTS*Negative Exponents*

What does a negative exponent do to its base?

Example: Simplify each of the following exponential expressions. Leave your answers with positive exponents only.

a) 2^{-4}

b) $(3x)^{-2}$

c) $(5x^2y)^{-3}$

d) $2^{-2} + 4^{-1}$

e) $(2a^{-2}b^3)^4$

f) $(4a^3b^{-1})^{-2}$

Fractional Exponents

A base with a fractional exponent that looks like _____ is just another way to write _____.

Example: Simplify each of the following exponential expressions. Leave your answers with positive exponents only.

a) $4^{1/2}$

b) $49^{1/2}$

c) $25^{1/2}$

d) $5^{1/2} \cdot 5^{1/2}$

e) $125^{1/3}$

f) $(-343)^{1/3}$

g) $32^{1/5}$

h) $x^{2/7} \cdot x^{3/4}$

i) $\left(\frac{81y^{16}}{16x^{12}}\right)^{1/2}$

j) $\frac{x^{1/2}y^{-1/3}}{x^{3/4}y^{1/2}}$

k) $\frac{(x^{1/2}x^{3/12})^{1/3}}{x^{2/3}}$

Simplifying With Fractional Bases Other Than $\frac{1}{b}$.

Example: Simplify each of the following exponential expressions.

a) $8^{2/3}$

b) $64^{2/3}$

c) $(-8)^{2/3}$

d) $(-216)^{-2/3}$

e) $-(-27)^{-1/3}$

Applications

Example: A certain medication is eliminated from the bloodstream at a rate of about 20% per hour. At 2:00 pm the amount of medication in a patients bloodstream was measured to be 40 mg.

- a) Write an exponential function that models this situation. Explain what each variable stands for.

- b) Using your equation, how much of the medication is in the patient's bloodstream at 5:00 pm the same day?

- c) Using your equation, how much of the medication was in the patient's bloodstream at 11:00 am the same day?

- d) Using your equation, how much of the medication was in the patient's bloodstream at 7:30 on the same day?

- e) Using your equation, how much of the medication was in the patient's bloodstream at 12:45 on the same day?

Example: A certain baseball card was purchased in 1997 for \$50. The card's value has been increasing 22% every decade.

- a) Write an exponential function that models the value of the baseball card x years after 1997.

- b) According to your equation, how much is the card worth in the year 2007?

- c) According to your equation, how much will the card be worth in 2010?

- d) According to your equation, how much was the card worth in 1987?

- e) According to your equation, how much was the card worth in 1980?