5.1 Growth and Decay Integral Exponents

Suppose the cost of a hamburger is increasing at 9% each year. If a hamburger costs \$5 today,

a) How much will it cost in one year?

b) How much will it cost in two years?

c) How much will it cost in 10 years?

d) How much will it cost in t years?
e) What would a negative exponent mean?

The cost of a graphing calculator that costs \$150 today is decreasing by 8% each year.
a) How much will the same calculator cost in one year?

b) How much will the same calculator cost in t years?

Growth and decay can be modeled by $A(t) = A_0(1 + r)^t$

where A_0 = the initial amount A(t) = the amount at time t r = the growth rate

if r > 0, exponential growth if r < 0, exponential decay

Exponent Laws

Same Bases:

1.
$$b^{x} \cdot b^{y} =$$

$$2. \quad \frac{b^x}{b^y} =$$

3. If
$$b \neq 0$$
, 1 or -1 ,
then $b^x = b^y$ if and only if $x = y$

Same Exponents:

$$4. (ab)^x =$$

$$5. \left(\frac{a}{b}\right)^x =$$

6. If
$$x \neq 0$$
, $a > 0$, $b > 0$,
then $a^x = b^x$ if and only if $a = b$.

Power of a Power:

7.
$$(b^x)^y =$$

Definitions:

1.
$$b^0 =$$

2.
$$b^{-x} =$$

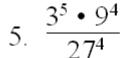
Examples:

1. Simplify:
$$\left(\frac{b^2}{a}\right)^{-2} \bullet \left(\frac{a^2}{b}\right)^{-3} a \neq 0, b \neq 0$$

2. Simplify:
$$\frac{x^5 \cdot x^{-2}}{x^{-3}}$$

3.
$$(2^{-1} \cdot 4^{-1})^{-1}$$

4.
$$(2^{-1} + 4^{-1})^{-1}$$



CW #37

Item	Annual rate	cost now	cost in t	cost in 10
	of increase		years	years
Bike	5%	\$200		
Jeans				
			75(1.08) ^t	

Item	Annual rate	value now	value in t	value in 10
	of decrease		years	years
Car	20%	\$25,000		
Computer				
			750(.65)	

3.
$$\left(\frac{2}{3}\right)^{-2}$$
 4. $5 \cdot 3^{-2}$ 5. $(5 \cdot 3)^{-2}$

6.
$$(5^{-2} \cdot 3^{-2})^{-1}$$
 7. $(5^{-2} + 3^{-2})^{-1}$

8.
$$\frac{12^3}{6^3}$$
 9. $\frac{8^n \cdot 3^n}{4^n}$ 10. $x^{-3}(x^5 + x^3)$

$$11. \ \frac{3a^3 - 6a^6}{a^{-1}}$$



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Write each problem and show work.