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. $b^x \bullet b^y =$

2. $\dfrac{b^x}{b^y} =$

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: $\left(\dfrac{b^2}{a}\right)^{-2} \bullet \left(\dfrac{a^2}{b}\right)^{-3}$ $a \neq 0,\ b \neq 0$

2. Simplify: $\dfrac{x^5 \bullet x^{-2}}{x^{-3}}$

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

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

5. $\frac{3^5 \bullet 9^4}{27^4}$

CW #37

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

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

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

HW #38

Pg 173 2 – 34 even, 38, 40, 41
Write each problem and show work.