Date: ________________________

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) use exponential functions to model exponential growth and decay.

Last day's work: pp. 251-253 #(1,2)ab, 3, 4ab, 5ab, 9

(*Optional Wkst 4.6 Extra Practice*)

(text questions at end of lesson)

Order Change Spring 2017

pp. 251-253 #1 – 5, 9, 10 [12 – 14]

4.7 Applications Involving Exponential Functions

Date: Apr.13/17

Ex.1 You invest $1000 at 8% /a compounded annually.
How much will you have after 20 years?

# of years	0	1	2	3			n
Amount	1000	1080	1166.40	1259.71			
		$1000(1.08)^1$	$1000(1.08)^2$	$1000(1.08)^3$			$1000(1.08)^n$

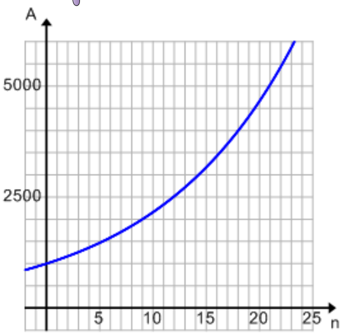
$A_1 = 1000(1.08)$
$= 1080$

$I_1 = 1000(0.08)(1)$ $= prt$
$= 80$

$A = P + I$

$A_2 = 1080(1.08)$
$= 1166.40$

$A_2 = 1000(1.08)(1.08)$
$= 1000(1.08)^2$



$$A = 1000(1.08)^n$$

Initial Amount

Growth Factor

Initial Amount	1000
Growth Rate	.08
Growth Factor	1.08

b) if $n = 20$
$A = 1000(1.08)^{20}$
$\doteq 4660.957$
$\doteq \$4660.96$

$4660.96

Ex.2 A superball loses 10% of its height after each bounce.
It was dropped from 12 *m*.

Model the bounce height with a decay function.

Initial Amount	12
Decay Rate	0.1
Decay Factor	1-0.1 = 0.9

$$H = \underbrace{12}_{\text{Initial Amount}}\underbrace{(0.90)}_{\text{Decay Factor}}^{n}$$

1 ± r

Each bounce is 90% of the previous bounce.

The function $f(x) = a(b^x)$ can be used as a model to solve problems involving exponential growth and decay.

$$f(x) = a\,(b^x)$$

Where a is the initial value,
b is the growth factor and
x is the number of compounding periods.

Ex.3 A hockey card is purchased in 1990 for $5.00.
The value increases by 6% each year.
Write an equation and determine it's value in 2011.

Let V represent the value of the card in dollars.
Let n represent the number of years since 1990.

$V = 5(1.06)^n$

$= 5(1.06)^{21}$

$\doteq 16.997$

$\doteq \$17.00$

$\therefore$ the card is worth $17.

$n = 2011 - 1990$

$= 21$

$r = 6\%$

$= 0.06$

$b = 1 + r$

$b = 1 + 0.06$

$= 1.06$

$17.00

$V = 5(1.06)^{n-1990}$

Ex.4 In 1980 the population of the town of St. Albert, Alberta was 20 000. If the town grows at a rate of 2% a year, what was the population in 2014?

$P = 20000(1.02)^n$

$= 20000(1.02)^{34}$

$\doteq 39213.5$

$\doteq 39213$

$n = 2014 - 1980$

$= 34$

39 213

There are growth and decay applications that involve doubling times or half-lives. The formula can be altered to:

$$N(t) = N_o(2)^{\frac{t}{d}}$$

← total time

← doubling time

$$N(t) = N_o\left(\frac{1}{2}\right)^{\frac{t}{d}}$$

← total time

← amount of time to have **50%** left

= **half-life**

Ex.5 A biology experiment starts with 1000 cells.
After 4 hours the count is estimated to be 256 000.
What is the doubling period for the cells?

$$A = 1000(2)^{\frac{4}{t}}$$

$$256\,000 = 1000(2)^{\frac{4}{t}}$$

$$\frac{256\,000}{1000} = \frac{\cancel{1000}(2)^{\frac{4}{t}}}{\cancel{1000}}$$

$$256 = 2^{\frac{4}{t}}$$

$t = 8$

$2^{\frac{4}{8}}$

$= 2^{\frac{1}{2}}$

$\doteq 1.41$

$t = 4$

$= 2^{\frac{4}{4}}$

$= 1$

$t = \frac{1}{2}$

$2^{\frac{4}{\frac{1}{2}}}$

$4 \div \frac{1}{2}$

$4 \times \frac{2}{1}$

$= 8$

$= 2^{8}$

$= 256$

$\therefore t = \frac{1}{2}$

∴ the doubling period for cells is a 1/2 hour.

Are there any Homework Questions you would like to see on the board?

Last day's work: pp. 251-253 #(1,2)ab, 3, 4ab, 5ab, 9
(*Optional Wkst 4.6 Extra Practice*)
(text questions on following screens)

Today's Homework Practice includes:
pp. 261-262 # 1 – 8
QUIZ NEXT CLASS