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

Last day's work: pp. 261-262 # 1 – 8c

2b Chart
d

6f

6def 4
8 14c

Today's Homework Practice includes:
pp. 267-269 #(1 – 17)ace
p. 270 # 1 – 7

17a

Work Ahead to: pp. 251-253 #(1,2)cd, 4c, 5cd, 10 [12 – 14]
(*Optional Wkst 4.6 Extra Practice*)

Hwk from 4.7 pp. 261-262 (last class)

1. Solve each exponential equation. Express answers to the nearest hundredth of a unit.

a) $A = 250(1.05)^{10}$

b) $P = 9000\left(\frac{1}{2}\right)^{8}$

c) $500 = N_0(1.25)^{1.25}$

d) $625 = P(0.71)^{9}$

2. Complete the table.

	Function	Exponential Growth or Decay?	Initial Value	Growth or Decay Rate
a)	$V(t) = 20(1.02)^t$			
b)	$P(n) = 1(0.8)^n$	decay	1	20%
c)	$A(x) = 0.5(3)^x$			
d)	$Q(w) = 600\left(\frac{5}{8}\right)^w$	decay	600	$\frac{3}{8} = 37.5\%$

$b = 0.8$

$b = 1 \pm r$

$\because$ decay

$\therefore b = 1 - r$

$0.8 = 1 - r$

$0.8 - 1 = -r$

$-0.2 = -r$

$\therefore r = 0.2$

$\frac{5}{8} = 1 - r$

$r = 1 - \frac{5}{8}$

$= \frac{3}{8}$

3. The growth in population of a small town since 1996 is given by the function $P(n) = 1250(1.03)^n$.

a) What is the initial population? Explain how you know.
b) What is the growth rate? Explain how you know.
c) Determine the population in the year 2007.
d) In which year does the population reach 2000 people?

4. A computer loses its value each month after it is purchased. Its value as a function of time, in months, is modelled by $V(m) = 1500(0.95)^m$.

a) What is the initial value of the computer? Explain how you know.
b) What is the rate of depreciation? Explain how you know.
c) Determine the value of the computer after 2 years.
d) In which month after it is purchased does the computer's worth fall below $900?

a) $V(0) = 1500(0.95)^0$
$= 1500(1)$
$= 1500$

b) $b = 0.95$
$\therefore r = 0.05$
$\therefore b = 1 \pm r$
$= 1 - 0.05$
$= 0.95$

$0.95 = 1 - r$
$0.95 - 1 = -r$
$-0.05 = -r$
$r = 0.05$

c) $m = 2 \times 12$
$= 24$

$V(24) = 1500(0.95)^{24}$
$\doteq 437.983$
$\doteq \$437.98$

d) $V(m) = 900$

$900 = 1500(0.95)^m$

$\frac{900}{1500} = 0.95^m$

$\frac{3}{5} = 0.95^m$

$0.6 = 0.95^m$

m	V(m)
21	0.34
17	0.41
12	0.54
11	0.568
10	0.59

$\therefore$ in the 10th month.

≈ 9.958

5. In 1990, a sum of $1000 is invested at a rate of 6% per year for 15 years.
   a) What is the growth rate?
   b) What is the initial amount?
   c) How many growth periods are there?
   d) Write an equation that models the growth of the investment, and use it to determine the value of the investment after 15 years.

6. A species of bacteria has a population of 500 at noon. It doubles every 10 h. The function that models the growth of the population, P, at any hour, t, is

$$P(t) = 500\left(2^{\frac{t}{10}}\right).$$

   a) Why is the exponent $\frac{t}{10}$?
   b) Why is the base 2?
   c) Why is the multiplier 500?
   d) Determine the population at midnight.
   e) Determine the population at noon the next day.
   f) Determine the time at which the population first exceeds 2000.

d) $t = 12$ $\therefore P(12) = 500\left(2^{\frac{12}{10}}\right)$

$\doteq 1148.6$

$\therefore$ Pop'n at midnight is 1148.

e) $t = 24$

$P(24) = 500\left(2^{\frac{24}{10}}\right)$

$\doteq 2639.0$

$\doteq 2639$

f) $P(t) = 2000$

$2000 = 500\left(2^{\frac{t}{10}}\right)$

$\frac{2000}{500} = 2^{\frac{t}{10}}$

$4 = 2^{\frac{t}{10}}$

$2^2 = 2^{\frac{t}{10}}$

$\therefore 2 = \frac{t}{10}$

$\therefore t = 20$

$\therefore t = 0$ is NOON

$\therefore t = 20$ is 8 am.

7. Which of these functions describe exponential decay? Explain.

a) $g(x) = -4(3)^x$

b) $h(x) = 0.8(1.2)^x$

c) $j(x) = 3(0.8)^{2x}$

d) $k(x) = \frac{1}{3}(0.9)^{\frac{x}{2}}$

$A = B^x$

$x = \frac{\log A}{\log B}$

Check $3^x = 81$

$x = \frac{\log 81}{\log 3}$

$= 4$

8. A town with a population of 12 000 has been growing at an average rate of 2.5% for the last 10 years. Suppose this growth rate will be maintained in the future. The function that models the town's growth is

$$P(n) = 12(1.025^n)$$

where $P(n)$ represents the population (in thousands) and n is the number of years from now.

a) Determine the population of the town in 10 years.

b) Determine the number of years until the population doubles.

c) Use this equation (or another method) to determine the number of years ago that the population was 8000. Answer to the nearest year.

d) What are the domain and range of the function?

a) $n = 10$

$\therefore P(10) = 12(1.025^{10})$

$\doteq 15.3610$

$\therefore 15\,361.0$

b) $p(n) = 24$

$24 = 12(1.025)^n$

$\frac{24}{12} = 1.025^n$

$2 = 1.025^n$

$A = B^x$

$n = \frac{\log 2}{\log 1.025}$ $\leftarrow$ $x = \frac{\log A}{\log B}$

$\doteq 28.07$

$\therefore$ it takes 28.07 years.

c) $P(n) = 8$

$8 = 12(1.025^n)$

$\frac{8}{12} = 1.025^n$

$\frac{2}{3} = 1.025^n$

$* \frac{\log \frac{2}{3}}{\log 1.025} = n$

$n \doteq -16.42$

$\therefore 16$ years ago

p. 269 **17.** The population of a city is growing at an average rate of 3% per year. In 1990, the population was 45 000.

a) Write an equation that models the growth of the city. Explain what each part of the equation represents.

b) Use your equation to determine the population of the city in 2007.

c) Determine the year during which the population will have doubled.

d) Suppose the population took only 10 years to double. What growth rate would be required for this to have happened?