3/21/2011

Section 12

- Exam 3 Mar 31 (Thursday)
  - Review Posts Wednesday
- Alg Exam 2 April 11th
  - Review Online Now

Models:

$y = Cb^x$ — "base" multiplier. "general exponential model"

(C: initial value (y int))

$y = Ce^{kt}$ "continuous exponential model"

$b = e^k \iff \ln(b) = k$

$y = Cb^x$	$y = Ce^{kt}$
C = initial value.	C = initial value
$b > 1$: growth $r = b - 1$	$k > 0$: growth
$b < 1$: decay $r = 1 - b$	$k < 0$: decay
	k = continuous growth/decay rate.

If asked to use Ce^{kt}, two steps to formula:

1.) Identify C (set up $t = 0 \rightsquigarrow$ to identify C)

2.) Plug in a point to solve for k.

3.) Do whatever is asked w/ formula.

1.) Green W.S.

Find an equation : $y = Ce^{kt}$

$t=0$ ⇔ 1997 tuition : \$3,111

1.)

$$\Rightarrow y = 3{,}111e^{kt}$$

2.) Plug in $(\underset{2004}{t=7}, 5132)$

$$5132 = 3111e^{k(7)}$$

$$\frac{5132}{3111} = e^{k7}$$

$$\ln\left(\frac{5132}{3111}\right) = 7k$$

$$\frac{1}{7}\ln\left(\frac{5132}{3111}\right) = k$$

$$k \approx 0.0715$$

$$\Rightarrow \boxed{y = 3111\, e^{0.0715t}}$$

Tuition in $\underset{t=10}{2007}$ → $y = 3111\, e^{0.0715(10)}$

$\approx \$6359.93$

3.) $y = Ce^{kt}$ (initial val.)

half life is 10 years: 10 years later

$\frac{1}{2}$(initial) $= \frac{1}{2}C$

$$\Rightarrow \frac{1}{2}C = Ce^{k(10)}$$

$$\ln(1/2) = 10k$$

$$\frac{-\ln(2)}{10} = \frac{\ln(1/2)}{10} = k \approx -0.0693$$

(general formula to get k given half life

$$-\ln(2)/\text{half life} = k. \quad)$$

22 years later? $y = Ce^{-0.0693t}$

$y = Ce^{-0.0693(22)}$

$= C(0.2176)$

$\Rightarrow$ 21.76% remains.

6.) (c) made up in class.

Find the inverse and explain its app

$$P = \frac{10{,}000}{1+9e^{-t/5}} \rightarrow t = -5\ln\left(\frac{10{,}000-P}{9P}\right) = 5\ln\left(\frac{9P}{10{,}000-P}\right)$$

$P(1+9e^{-t/5}) = 10{,}000$

$P + 9Pe^{-t/5} = 10{,}000$

Given a population level, the inverse approximate in how many month that pop is attained.

(d) Find asymptotes of original.

no V.A. (Domain is all reals)

H.A. as $t \to \infty$

$y = 10{,}000.$