Name Answers Quiz Exponential Equations and Logs version 1 2017 25/25

1) Write an exponential equation for each situation described. (For the problems below use the non-continuous form unless continuous growth or decay is explicitly stated.)

a) A population is 12,000 and is increasing at a rate of 0.15% annually. +2 each

y = $12000(1.0015)^{x}$ [2]

b) A population 3,000 and is decreasing at a rate of 4% every two years.

y = $3000(.96)^{x/2}$ [2]

c) The population is 95,681 and is increasing continuously at a rate of 6%.

y = $95,681e^{.06x}$ [2]

d) The population 300,000 and is decreasing continuously at a rate of 0.5%.

y = $300,000e^{-.005x}$

e) A bank account is opened with an initial investment of $5,000 and an interest rate of 1.3% compounded monthly.

y = $5000\left(1+\frac{.013}{12}\right)^{12x}$

f) A bank account is started with a $5,000 deposit and the interest rate is 1.1% compounded continuously.

y = $5000e^{.011x}$

g) The value of an investment started with $800 dollars is tripling every 15 years.

y = $800(3)^{x/15}$

h) The initial population of bacteria 4 is doubling 3 times per hour.

y = $y_0(2)^{3x}$ or $4(2)^{3x}$

2) The exponential function below is defined by the following sets of data points.

Determine the values of a and y_o.

x	y
3	736
6	588.8
9	471.04

) .8

$y = y_o(a)^{x/3}$ $a = 0.8$ ✓ $y_o = 920$ ✓

3) College tuition costs are increasing at an exponential rate. In 1980 the average cost for a year of college was $3,500. In 2016 (36 years later) it was $32,000.

a) Write a non-continuous exponential function representing the cost of a year of college since 1980 as a function of time in years.

x	y
0	3500
36	32,000

$\frac{32,000}{3500} = 9.142857143...$

$\frac{64}{7}$

$y = 3500\left(\frac{64}{7}\right)^{x/36}$ ✓ ✓ ✓

or $y = 3500(9.143)^{x/36}$

[3]

b) Use your equation to determine the average annual (1 year) percent increase in the cost of a college during this the 36 year period. (Round to two decimal places.)

$y = 3500(1.0634)^x$

6.34%

[1]

$-\frac{1}{2}$ if find 1.0634 but say 1.06%

4) During the ten year period from 2005 to 2015 the population in New Jersey increased by 4.5%. Assume that the population can be modeled as a non-continuous exponential function. At this growth rate, determine how long it will take New Jerseys population to double. (Round to two decimal places.)

$y = y_0(1.045)^{x/10}$

[3] $2 = (1.045)^{x/10}$ ✓

$\log_{1.045} 2 = \frac{x}{10}$ ✓

$10\log_{1.045} 2 = x$

157.47

157 years

Extra credit: Use **log** or **ln** to solve for x in the following equation. Round all answers to the nearest thousandth (3 decimal places). Show your work on a separate piece of paper!!!

Solve for x: $250e^{-0.01x} = 10(1.01)^{\frac{x}{2}}$

$25e^{-.01x} = 1.01^{x/2}$ +1

$\ln 25 + -.01x = \frac{x}{2}\ln 1.01$

$x\left(\frac{1}{2}\ln 1.01 + .01\right) = \ln 25$

$x = 214.948$