

Give all answers accurate to 3 decimal places unless otherwise directed.

1. Give an exponential function that models the following situations:

a) The initial population of 20 thousand increases by 4% each year.

$$P(t) = \underline{20(1+.04)^t}$$

P in thousands, t in years.

b) The initial population of 35 thousand triples every 5 hours.

$$P(t) = 35(3^{(t/5)}) \text{ or } P(t) = 35(1.2457)^t$$

P in thousands, t in hours.

c) The initial population of 210 decreases by 8% each day.

$$P(t) = 210(1-.08)^t \text{ or } P(t) = 210(.92)^t$$

P in units, t in days.

d) The amount at 1 hour is 15, the amount at 5 hours is 42.

$$A(t) = \underline{11.592(1.294)^t}$$

A in units, t in hours.

2. You invest \$2,500 on January first 2003 at 6% annual interest compounded once a year.

a) Write the equation for the amount **A** as a function of time *t* where *t* is in years and **A** is in dollars.

$$A(t) = \underline{2500(1+.06)^t}$$

b) How much is in the account after 8 years?

$$\underline{3984.62}$$

c) How long will it take for the initial amount to double?

$$\underline{11.896 \text{ years}}$$

d) Your friend Sam invests \$5000 on January first, 2003 at the same rate. How long will it take his investment to double?

$$\underline{11.896 \text{ years}}$$

3) A naturally growing bacteria population numbers 69 thousand at 12 noon and 135 thousand by 1pm.

a) Write the formula , $P(t) = P_0(b^t)$, giving the population after t hours.

$$P(t) = \underline{69(1.956)^t}$$

b) How many bacteria will there be at 2:45 pm?

$$\underline{439.0897}$$

c) What is the hourly percent increase for this population?

$$\underline{95.56\%}$$

4. A couple plans to make a deposit in a savings account paying 4% annual interest. How much will they need to deposit when their child is born in order for the account to contain \$50,000 in eighteen years?

$$P_0 = \underline{24681.41}$$

5. Given the following population data, where the population is in thousands:

Year	Time t	Population	Prediction	Error	Error ^2
1950	0	506			
1960		594			
1970		674			
1980		880			

a) Find the “best fit” exponential model for the given data.

$$P(t) = \underline{497.038(1.018)^t}$$

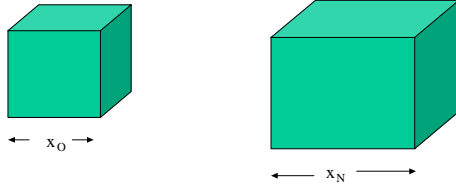
b) Find the sum of the square of the errors.

$$SSE = \underline{2357.868}$$

c) Using your model predict the population in the year 2000.

$$P(50) = \underline{1212.77}$$

6. The edge x of a cube is 10 inches. By what percent is the volume, $V=x^3$, increased if the edge is increased by 5%?



$$X_{old} = 10$$

$$X_{new} = 10(1+0.05) = 10.5$$

$$V_{old} = 1000$$

$$V_{new} = 1157.625$$

Solve $1157.625(1 + p)$ for p .

15.76%