Math 1101 Test Three Review and Practice

Review of section 4.1:

Recall there are three major equations that you will use for saving account problems:

1. A = $P(1+r)^t$ (this formula is used for annual interest accounts)
A = amount in the account after t years
P = the principal amount invested in the account
r = the interest rate given to the account
t = number of years money is left in the account

**we know to use this formula if the problem says that the account is given interest annually or once per year.

for example: Steve invest $3500 into a savings account that pays 3% annual interest and leaves it there for t years....

the formula you would create would look like

A = $3500(1+.03)^t$

2. A = $P(1+\frac{r}{n})^{nt}$ (this formula is used for compounded but not continuous interest)
A = amount in the account after t years
P = the principal amount invested in the account
r = the interest rate given to the account
n = the number of times the interest is applied to the account per year
t = number of years money is left in the account

** we know to use this formula if the problem says anything about the interest be compounded quarterly or monthly, or weekly...so forth

semiannually	means n=2
quarterly	means n=4
monthly	means n=12
weekly	means n=52
daily	means n = 365

for example: Sally invest $20000 at 5% interest compounded weekly for t years...you would use the formula

A = $20000(1+\frac{.05}{52})^{52t}$

3. $A = Pe^{rt}$ (this formula is used if the problem says that the interest is applied continuously)

A = amount in the account after t years
P = the principal amount invested in the account
e = the irrational number 2.718.........
r = the interest rate given to the account
t = number of years money is left in the account

** this formula is also used to model populations that are growing at a continuous rate
** we know to use this formula when the problem says that a population or material is growing at a continuous rate

for example: A sample of 2 kudzu plants is growing at a continuous monthly rate of 3.5% ...you would use the formula:
$A = 2e^{.035t}$ where t is in months

4. The **effective annual yield (eay)** is the amount of annual interest needed to produce the same yield as r% compounded interest or continuous interest.

to find the eay we have two formulas:

1. if r is compounded n times per year then the eay = $(1+\frac{r}{n})^n - 1$

2. if r is compounded continuously then the eay = $e^r - 1$

Review of chapter 5 key concepts:

Chapter 5 deals with quadratic functions of the form f(x) = $ax^2 + bx + c$.

The graph of such a quadratic function is a parabola that opens up if a>0 and opens down if a<0.

Thus one of the main differences between these quadratic functions and the linear and exponential functions of chapters 2 and 3 is that these quadratic function increase half the time and decrease the other half where the linear and exponential functions were either always decreasing or always increasing.

This change in direction creates a turning point in the graph called the vertex. This vertex will serve as either the highest (maximum) or lowest (minimum) point in the graph.

To find this vertex we can use algebraic formulas like –b/(2a) etc.. or we can use our calculator.

To find the max or min of a parabola:

1. enter the given function into your calculator in y1
2. set a viewing window that allows you to see the vertex on the screen
3. Type 2nd trace maximum or minimum (depending on which one you are looking for)
4. move the cursor to a point on the curve that is left of the vertex hit enter
5. move the cursor to a point on the curve that is right of the vertex hot enter
6. hit enter again

notice that the calculator gives you both the x and y coordinate of the vertex, the x coordinate tells us **when the function obtained its max or min the y value tells us the **actual maximum or minimum value** obtained by the function

for example: given the function f(x) = $2x^2 + 4x - 8$ set your viewing window to xmin = -5 xmax = 5 xscal =1 ymin= -15 ymax = 70 yscal = 1 hit graph
then try to find the vertex using 2nd trace minimum
you should get minimum of x = -1 and y = -10

One application of interest in this chapter is the falling object problems. For these problems we will use the function:

$$y(t) = -16t^2 + v_0 t + y_0 \quad \text{where}$$

v_0 = the initial velocity of the object (ie. hard fast was it moving when it was thrown, kicked, shot , etc....will be positive if thrown upwards or negative if thrown downwards)

y_0 = the initial height of the object (ie. where was the object in relation to ground level when it was thrown or kicked..etc)

for example: A rocket is fired upwards from the top of a 120 ft building with an initial velocity of 280 feet per sec… you would use the formula:
$y(t) = -16t^2 + 280t + 120$

Lastly for review if you are asked to find the best fit quadratic model for a given data set and then asked to find this models SSE or average error you will follow the same calculator commands that you used in chapters 2 and 3 except that when you get the model and save it in y1 you will use stat calc 5 instead of stat calc 4 or 0.

1. If Tiffany invest $4500 at 3.8% interest compounded quarterly, how many years and quarters will it take for her money to grow to $15000?

2. Jimmy has $6000 to invest in an account that pays interest continuously. What interest rate does Jimmy need to ask for if he wants his money to double in 15 years?

3. Find the effective annual yield for the following accounts:

a. 4.7% compounded monthly

b. 3.8% compounded continuously

4. The population in thousands of people of a small town can be modeled by the function $P(t) = x^2 - 14x + 90$ where t = the number of years since 1960.

a. What was the population of the town in 1960?

b. In what year did the town reach its minimum population?

c. What was the minimum population obtained by the town?

d. In what month and year did the town return to its 1960 population?

5. An artillery shell is fired from the top of a 250 foot ridge with an initial velocity of 680 feet per second.

a. Write a formula that describes the height of the shell after t seconds.

b. Find the height of the shell after 6 seconds.

c. What is the maximum height obtained by the shell?

d. When will the shell hit the ground?

6. Given the data table below answer the questions that follow.

Price per unit	5	10	15	20	25	30
weekly profit in thousands	-18256	-1035	485	1200	520	-1200

a. Find the best fit quadratic model for the data listed above.

b. Find the SSE and average error for your quadratic model.

c. Predict the weekly profit if the company charges $22 per unit.

d. predict the price(s) that would cause the company to just break even.

e. What price would cause the company to have a maximum profit?

f. What is the company's maximum profit?

7.

Find the maximum value and the minimum value for the function $f(x) = 5x^2 - 30x + 55$ for $-2 \le x \le 4$.

8. Each of the following tables gives the values of a function f(x). The function f is either a linear or a quadratic function. Find the average rate of change for each function and then determine whether it is a linear or a quadratic function:

a)

x	13	18	19	23	27	31	38	52	60	66
f(x)	15.2	17.2	17.6	19.2	20.8	22.4	25.2	30.8	34	36.4
ARC										

b)

x	2	7	12	17	24	30	34	38	43	49
f(x)	134	639	1394	2399	4226	6182	7686	9350	44655	14751
ARC										

9.

Determine the value of the coefficient a so that the parabola $y = 4ax^2 + 6x - 24$ goes through the point P(-4, 68).