MATH 1030 - Introduction to Quantitative Analysis

Practice Test 2
April 1, 2012

Use the following formulas as appropriate.

- **Compound Interest Formula:**
  
  \[ A = P \left(1 + \frac{\text{APR}}{n}\right)^{nY} \]

- **Continuous Compounding Formula:**
  
  \[ A = P \times e^{(\text{APR} \times Y)} \]

- **Loan Payment Formula:**
  
  \[ \text{PMT} = \frac{P \times \left(\frac{\text{APR}}{n}\right)}{1 - \left(1 + \frac{\text{APR}}{n}\right)^{-nY}} \]

- **Savings Plan Formula:**
  
  \[ A = \text{PMT} \times \frac{\left(1 + \frac{\text{APR}}{n}\right)^{nY} - 1}{\left(\frac{\text{APR}}{n}\right)} \]

- **Annual Returns**
  
  \[ \text{Annual Return} = \left(\frac{A}{P}\right)^{1/Y} - 1 \]

- **Total Returns**
  
  \[ \text{Total Return} = \frac{A - P}{P} \]

1. Does it make sense: I have a 60% average on our assignments going into the final exam, but I still hope to raise my course average to 70% by getting an 80% on the final. (The final is worth 25% of the final grade.)
2. (a) The number of deaths due to poisoning in the US in a year (25,500) is _________ percent greater than the number of deaths due to falls (21,400).

(b) Ben is 20% taller than Betty, so Ben’s height is _________ percent of Betty’s height.

(c) The wholesale price of a refrigerator is 40% less than the retail price. Therefore, the wholesale price is _________ times the retail price.

3. I have a 20 percent off coupon for 1 gallon of Breyers ice cream. The ice cream is on sale for 40 percent off. My colleague thinks that this means that I can purchase the ice cream for 60 percent less than the normal price. Is he correct? Why or why not?
4. A brilliant but twisted programmer writes a computer virus that spreads pretty quickly. When you get infected, it sends an email to all of your friends (from your computer) with the subject “i luv u.” Your friends, desperate for your love, open the email and get infected. So in some sense, this virus is not so much exploiting a vulnerability in computers as much as it is exploiting a vulnerability in the human condition. 3000 computers were already infected on Jan 1, 2008. The number of infected computers increases by 5% per day.

(a) Find the equation of an exponential model of the given situation.

(b) How many computers will be infected on Jan 8, 2008?

5. In one MMORPG (massive multiplayer online role-playing game), two clans, each consisting of 2000 people, face off in an epic battle of pixelated death. According to the rules of the game, if either side ever has less than 10 members left, they must forfeit. The Blue Clan is clearly outmatched, and its numbers are diminishing by 15% each hour. Assuming this continues at the same rate, when will the Blue Clan lose?

6. In July 2000 you measured the circumference of a tree in the park. It was 36 inches. In July 2004,
you measured that the circumference of the same tree was 44 inches. Assume that the circumference grew at a constant rate.

(a) What is the independent variable?
(b) What is the dependent variable?
(c) Write down a linear function describing the relationship between the independent and dependent variables.

(d) What units are used for the dependent variable?
(e) What units are used for the independent variable?
(f) How old was the tree in 1999?  Hint: The tree begins its life with a circumference of approximately 0.

(g) Plot the function.

7. You want to buy an $18,000 car. Let’s consider two options:

(a) You decide to save up and buy the car in 4 years. Your bank account has an annual percentage rate of 4.7%.
   i. How much should you deposit each month?
ii. How much of the $18,000 will come from actual deposits?

(b) You decide to buy the car now on an installment loan. Your loan has an APR of 12%.
   i. How much money will you need to pay each month to pay off the loan in 4 years?

ii. How much will you pay for the car over the four years?

8. Suppose a savings account offers an APR of 5%.
   (a) What is the APY if interest is compounded monthly?

   (b) What is the APY if interest is compounded quarterly?
(c) What is the APY if interest is compounded continuously?

9. Your Mother invested $1200 into her favorite company in 1999. Her stocks are now worth $1900.
   (a) What is your mom’s total return?

   (b) What is her annual return?

10. A prominent restaurant in Paris is reported to have a rat infestation. Unfortunately, having not seen many animated Disney movies, the restaurant’s patrons do not know that the rats are actually the brains behind the restaurant’s culinary successes. When word spreads about the rats, the number of patrons decreases by 86% each month (30 days).
   (a) Find the half life for the number of patrons.

   (b) By what percentage will the number of patrons decrease in a week? *Hint: It may be helpful to first find the percentage of patrons that remain after a week.*