MATH 1030-005, Exam 2 Sample **Fall 2012**

1. You are in the process of buying a house, and you need a mortgage loan of $120,000. You got approved for a 30-year fixed rate loan at an APR = 5.45%, and closing costs of $1,000 plus 1 point. Determine your total closing costs, monthly payments, and the amount of interest paid over the loan term.

2. Joshua will start saving at age 18 for his retirement. His investment plan pays an APR of 6.75%, and he would like to retire at age 63. How much should he deposit monthly if he

   (a) wants to have $3 million when he retires?

   (b) wants to draw an income of $150,000 per year – forever (after he retires)?

3. Poaching is causing a population of elephants to decline by 11% per year. There are 25,000 elephants today.

   (a) Write an equation that describes this situation.

   (b) What is the approximate half-life for the population?

   (c) How many elephants will remain in 50 years?

   (d) In what year will there be 1,000 elephants left? (*Hint:* $\log_{10} x^y = y \log_{10} x$)

4. An insurance company has actuarial data which shows that a person who is 20 years old has 58.2 years of life remaining and that a person who is 60 years old has 23.8 years of life remaining.

   (a) Write a linear equation describing this relationship.

   (b) Based on your model, what is the remaining lifetime of a person who is 33 years old?

   (c) If a person has 20 years of life remaining, how old is he/she?

   (d) Graph this situation.

5. The cost of renting a limousine is a flat \$80, plus an additional 34 cents per minute.

   (a) What is the independent variable here?

   (b) Write a linear equation for the given situation.

   (c) How much would it cost to keep the limousine for 3 hours?

   (d) For how long can you keep the limousine with \$200?

6. Without using your calculator, Show that $\log_{10} \pi$ cannot be between 3 and 4.
   (*Hint:* $\log_{10} 10^x = x$)

MATH 1030, Exam 2 formula sheet

1. **Compounded Interest Formula** $A = P\left(1 + \frac{APR}{n}\right)^{nY}$
2. **Continuous Compounding** $A = Pe^{(APR \cdot Y)}$
3. **Savings Plan Formula** $A = PMT \cdot \frac{\left(1+\frac{APR}{n}\right)^{nY}-1}{\frac{APR}{n}}$
4. **Loan Payment Formula** $PMT = \frac{P \cdot \left(\frac{APR}{n}\right)}{1-\left(1+\frac{APR}{n}\right)^{-nY}}$
5. **Approximate Doubling Time Formula** $T_{double} \approx \frac{70}{P}$
6. **Approximate Half-Life Formula** $T_{half} \approx \frac{70}{P}$
7. **Exponential Growth Formula Using** T_d $new\,value = old\,value \times 2^{t/T_{double}}$
8. **Exponential Decay Formula Using** T_h $new\,value = old\,value \times \left(\frac{1}{2}\right)^{t/T_{half}}$
9. **Exponential Growth Formula** $new\,value = old\,value \times \left(1 + \frac{P}{100}\right)^{Y}$
10. **Exponential Decay Formula** $new\,value = old\,value \times \left(1 - \frac{P}{100}\right)^{Y}$
11. **Exact Doubling Time Formula** $T_{double} = \frac{log(2)}{log(1+r)}$
12. **Exact Half-Life Formula** $T_{half} = -\frac{log(2)}{log(1+r)}$