MATH 1030-004, Exam 2 Sample **Spring 2014**

1. You are in the process of buying a house, and you need a mortgage loan of \$150,000. You got approved for a 30-year fixed rate loan at an APR = 5.00%, and closing costs of \$750 plus 2 points. Determine your total closing costs, monthly payments, and the amount of interest paid over the loan term.

2. Show that $\log_{10} 50$ is less than 2, without using your calculator.
(*Hint:* $\log_{10} 10^x = x$)

3. The world birth rate today (year 2014) is 2.0 births per 100 people, and the world death rate is 0.84 deaths per 100 people.

   (a) Find today's world growth rate (in %).

   (b) Using this growth rate, predict what the population should be in 2081, assuming there are 7 billion people today.

   (c) What is the approximate doubling time for the population?

   (d) Using this doubling time, compute in what year should the population reach 28 billion.

4. In 1970, Power Town population started increasing by 6.5% every year. The population was 15,000 in 1970.

   (a) Write an equation that describes this situation.

   (b) Using part (a), calculate what the expected population of Power Town for 2016 is.

   (c) In what year will there be 1,500,000 people in Power Town?

   (d) This is an example of
      i. exponential decay
      ii. exponential growth
      iii. linear decay
      iv. linear growth

5. A box jellyfish is the most venomous creature on Earth. In fact, its venom destroys healthy heart cells in a human at a rate of 20% per minute.

   (a) Find the half-life for the heart cells. *(Note: you cannot use the approximate half-life formula.)*

   (b) Use this half-life to write an exponential equation of the given situation.

   (c) Use the growth rate to write an exponential equation of the given situation.

   (d) What fraction of healthy heart cells will be left after 5 minutes?

6. The cost of renting a car is a flat $60, plus an additional 10 cents per mile that you drive.

   (a) What is the independent variable?

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

   (c) How much would it cost to drive the car 500 miles?

   (d) How far can you go for $100? *(Use part (c) equation to answer this.)*

   (e) Graph this situation.

7. The number of certain cancer cells in a human body doubles every 3.2 months.

   (a) how long will it take for the number of cells to triple?

   (b) If the tumor begins with 20 cells, how many will there be in 5 years?

8. An insurance company has actuarial data which shows that a person who is 25 years old has 55 years of life remaining, and that a person who is 65 years old has 22 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 30 years of life remaining, how old is he/she?