Homework 7 (MATH 4300-01) **Name (Print):**
Due date: Friday, Nov. 22, 2013

1. Consider the simple interest formula $S_n = (1 + n\ p)\ S_0$ and the compound interest formula $S_n = (1 + p / r)^n\ S_0$. There are three options to earn interest. Company A offers simple interest at a rate of 6%. Company B offers compound interest at a 4% rate with a conversion period of one month. Company C offers compound interest at a 4% rate with a conversion period of three months.
   a) Calculate for the three cases the amount on deposit after 5, 10, 15, and 20 years for any principal S_0.
   b) Which interest offer maximizes the amount on deposit after 5, 10, 15, and 20 years?

2. A company deposits a sum of money S_0 in a fund earning 100 p% interest compounded monthly. The company also deposits a sum S_0 in this fund at the end of each conversion period.
   a) Find the difference equation for this problem and its solution.
   b) Simplify the solution for the case that $p / r << 1$.

3. In 1202 Fibonacci, a famous Italian mathematician who is known for the spreading of the Hindu-Arabic numeral system in Europe, was interested in the reproduction of rabbits. He considered the following conditions:
   - One male rabbit and one female rabbit have just been born.
   - A rabbit will reach sexual maturity after one month.
   - The gestation period of a rabbit is one month.
   - A female rabbit gives birth every month after reaching sexual maturity.
   - A female rabbit will always give birth to one male and one female rabbit.
   - Rabbits never die.

   a) Calculate the number of the pairs of rabbits for the first five months.
   b) Derive the difference equation that describes the number of the pairs of rabbits per month.
   c) Solve the difference equation.
   d) Calculate how many pairs of rabbits will there be a year from now.