

Homework 8 (MATH 4300-01)
Due date: Monday, Nov. 26, 2012

Name (Print):

1. 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 $p / r \ll 1$.

2. 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.

3. Consider a modification of the red blood cell production model discussed in Sect. 4.3.4. In an attempt to formulate a better model, we assume that the number of red blood cells produced by the bone marrow is a constant K (which means that M_{n-1} is replaced by K).
 - a) Solve the resulting difference equation analytically.
 - b) Assume that $R_0 = 0.9$, $f = 0.01$, and $K = 0.01$. Discuss the suitability of the resulting solution as a model for the red blood cell production.