

MATH 2600/STAT 2600, Theory of Interest

FALL 2010

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Homework Sheet 4

Due: Thursday 21st October: 1:00 PM

1. John makes a deposit of \$2,000 at the end of every year into an account that pays interest at  $j_{12} = 5\%$ . How much is in the account at the end of 12 years?
2. Mr. Wilson wants to save up \$20,000 by the time his daughter goes to university in 9 years time. He plans to make monthly payments into an account that give  $j_4 = 2\%$  interest. What should the payment be each month if:
  - (a) The account uses simple interest for partial interest periods.
  - (b) The account uses compound interest for partial interest periods.
3. Ms. King buys a house for \$250,000. She makes a down payment of \$50,000 and takes out a mortgage for the remaining \$200,000. The interest rate on the mortgage is  $j_2 = 10\%$ .
  - (a) If she takes a 20 year mortgage, what are the monthly payments, and what is the concluding smaller payment?
  - (b) (i) If she can afford up to \$2500 a month, how many years should her mortgage be (it has to be a whole number of years)?  
(ii) What would the monthly payments and the final payment be in this case?
  - (c) (i) If she can invest her money at  $j_{12} = 5\%$ , how much would the money left over from her \$2500 a month, when following the payment schedule in (a), be worth at the end of 20 years?  
(ii) What if she follows schedule (b)?
4. How much money is needed to establish a scholarship fund that will pay out \$20,000 a year forever, if the money is invested at  $j_4 = 6\%$ ?
5. Andrew starts a savings account on 1st January, which pays  $j_{12} = 4\%$  interest. He plans to make monthly deposits to the account for 25 years, starting on 1st January, until he retires. He starts by making a monthly deposit of \$200. Every year, on 1st January, his salary increases by 4%, and he therefore plans to increase his deposits by 4% at this time. If he keeps up this planned deposit schedule, how much will be in the account when he retires on 1st January in 25 years time (he does not make a deposit at this time)?

6. Joe has a salary of \$40,000 a year. Every year, he gets a 5% salary increase. He needs \$35,000 a year for his living expenses, and he saves the rest in an account which pays  $j_1 = 3\%$  interest. How much will be in the account after he makes his 16th deposit in 15 years time?