

# MATH2090 – Mathematics of Finance

## Assignment 4

Name:

MUN Number:

**Due Date:** Friday, 6 October

- Jane wishes to accumulate a pension over the last 25 years of her working life, at the beginning of each of the next 25 years she deposits \$7,500 into a retirement savings account with an annual interest rate of 3.01%. Immediately after the last deposit is made Jane transfers the accumulated funds to a conservative pension fund with an annual interest rate of 2.04%. At the end of that year, and at the end of each subsequent year for the next 20 years, Jane draws down her pension in 20 equal payments. What is the amount of Jane's annual pension payments?
- Easy Car Loans* offer an interest rate of 6.1%, converted quarterly. Jack takes out an \$8,000 car loan from *Easy* which is to be paid back over the next five years with equal monthly repayments.
  - What are Jack's monthly repayments to *Easy*?
  - Jack's friend Ron has a car loan from the competition, *Easier Car Loans*, with an annual interest rate of 6.2%. Ron has also borrowed \$8,000 and is also paying back his loan with equal monthly payments over the next five years. Who pays less per month Ron or Jack?
- Consider an annuity making  $m$  payments of 1 dollar, the first payment is made  $k$  years from now and every subsequent  $k$  years until the  $m$  payments have been made.
  - Show that the present value of the annuity is  $\frac{a_{\overline{mk}|}}{s_{\overline{k}|}}$ .  
[Hint: Introduce a new effective interest rate to cover the  $k$  year instalment period, or, follow the derivation of  $a_{\overline{n}|}$ , i.e. add up all the present values of the payments.]
  - What is the accumulated value of the annuity immediately after the last payment has been made?
- A benefactor wishes to endow, in perpetuity, five annual scholarships of \$3,000 at Memorial University. What is the minimum amount which the benefactor must invest, at annual interest rate of 2.6%, in order to fund the Scholarship?
- Annette has just started her new job and wants to set up a retirement savings plan. Her goal is to have \$1,500,000 in her retirement savings plan when she retires in 40 years time. Annette is going to put \$600 into her retirement account at the end of each month until she retires. What is the minimum annual effective interest rate Annette must get on her savings plan in order to achieve her retirement goal?