MATH2090 – Mathematics of Finance

Assignment 1

Name:

MUN Number:

Due Date: Friday, 15 September

1. Consider an initial bank deposit of $3,300 on April 1, 2002.
   (a) Assuming simple interest at 3.1% per year find the accumulated value to March 31, 2017.
   (b) Assuming compound interest at 3.1% per year find the accumulated value to March 31, 2017.
   (c) Assuming exact simple interest at 3.1% what is the accumulated value to September 10, 2017?
   (d) Assuming compound interest at 3.1% what is the accumulated value to September 10, 2017 (assume compound interest between integer periods)?

2. *Dodgey Finance* offers an investment at an annual interest rate of 7.9%, converted monthly.
   (a) What is the effective annual interest rate
   (b) *Real Finance* offers an investment with an 8% annual interest rate. Which company has the best investment? What is the cash difference between the investments for an initial investment of $12,000 over five years?

3. An investor holds a number of rental properties which provide an income of $4,250 per month which is paid into a bank account at the beginning of each month. The bank account pays an interest rate of 2.7%, compounded at the end of each month.
   (a) What is the accumulated value of the investment at the end of the first year?
   [Assume: no withdrawals from, or additional income into, the account.]
   (b) We also need to account for the maintenance, up-keep and accounting costs for the properties – these costs total $1,850 per quarter, paid from the account (at the end of each three monthly period) to the real estate agent managing the properties. What is the accumulated value of the investment at the end of the first year?
   (c) Finally we should also include the 'Tax Man"! Suppose the investor has a 'marginal tax rate' of 40%, i.e. the investor pays, annually, 40% of the profit (income minus expenses, see (b)) to the Taxation Office. Suppose this tax is also paid from the same account as in (a) and (b), and that it is paid at the end of each year. What is the accumulated value of the investment at the end of the first year , after the tax is paid?

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4. Consider the accumulation function $a(t) = \dfrac{2}{1+e^{-t}}$, is an accumulation function.
   (a) For this accumulation function find i_n, the effective interest rate in the n-th year, and show that $i_n \to 0$ as $n \to \infty$.
   (b) Find the force of interest, $\delta(t)$, for this accumulation function.