MATH 1090 - SUMMER 2007 - ASSIGNMENT #8

Annuities and loans

(1) A debt of \$7000 due in 5 years is to be repayed by a payment of \$3000 now and a second payment at the end of five years. The APR is 8% compounded monthly.
   (a) Draw a time line for this problem. Call the first payment A the second payment B and their sum C. Write down the data in the proper place on the time line, and in the proper row for A, B and C.
   (b) Find the value of A and C in 5 years. What should the second payment be?
   (c) What is the present value of the entire debt? In other words, what is the value of C now?

(2) A debt of \$5000 due 5 years from now and \$5000 due ten years from now is to be repaid by a first payment of \$2000 two years from now, a second payment of \$4000 four years from now, and a final payment due six years from now. If the interest rate is 2.5% compounded annually, how much is the final payment?
   (a) Draw a time line for this problem. Denote by A, B and C the first, second and third payments respectively. Let D be the first debt and E the second one. Write down the data in the proper place on the time line, and in the proper row.
   (b) Find the present values of A, B, D, and E.
   (c) We know that A, B, and C are supposed to cover D and E. Express this as an equation (which is true at every point in time).
   (d) What is the present value C? Write the new data in your diagram. What is the value of the final payment in 6 years?

(3) You bought a large screen TV for $\$3,000$ and agreed to pay it off in four payments, due every 3 months, whose present value is equal. In other words if A, B, C and D

are the payments then $A(0) = B(0) = C(0) = D(0)$. The nominal interest you will pay is 8% compounded quarterly.

(a) Draw the time line and fill in the data.

(b) If E denotes the total sum, write an equation that expresses the fact that A, B, C, D cover E.

(c) Find the present values of A, B, C, D.

(d) Find the values of A, B, C and D, each at the time of the payment.

(4) Find the amount of the following ordinary annuities: Pg 237 Ex 21, 22.

(5) Find the amount of the given annuity due: Pg 237 Ex 23, 24.

(6) A machine costing $10,000$ is to be replaced in ten years. To provide funds for a purchase of a new machine (at the same price), a sinking fund is set up at a rate of 6% compounded quarterly. Find the value of the equal payments that are due at the end of each quarter.

(7) A new machine will cost $\$20,000$ in six years. The old machine will then have a salvage value of \$1400. To provide funds for a purchase of a new machine, a sinking fund is set up at a rate of 12% compounded monthly. Find the value of the equal payments that are due at the end of each month.

(8) Find the present value of the ordinary annuities given in: Pg 236 Ex 13, 14, 17.

(9) Pg 237 Ex 27. Pg 242 Ex 2.

(10) (From an exam) Rutherford bought a new car for $\$30,000$. If he decides to make payments for five years at the end of each month at an interest rate of 4.5% compounded monthly, how much are his payments? What is the finance charge? (the amount that went towards interest, recall $I = S - P$).