MTH 351
Exam 2
Fall 2024

Show all work in a neat and organized fashion. Clearly indicate your answers.
100 points possible. 8 problems at 12 points each, plus 4 free points.

1. You are given a perpetual annuity immediate with annual payments increasing in geometric progression, with a common ratio of 1.08. The annual effective interest rate is 14%. The first payment is 5. Calculate the present value of this annuity.

2. 2000 is deposited into Fund X, which earns an annual effective rate of 4%. At the end of each year, the interest earned plus an additional 200 is withdrawn from the fund. At the end of the tenth year, the fund is depleted.

The annual withdrawals of interest and principal are deposited into Fund Y, which earns an annual effective rate of 8%.

Determine the accumulated value of Fund Y at the end of year 10.

3. An annuity pays 10 at the end of each quarter in the first year, 20 at the end of each quarter in the second year, and continues to increase until it pays 150 at the end of each quarter during the 15th year. Calculate the present value of the annuity at an annual effective interest rate of 9%.

4. Find the present value of an annuity-immediate such that payments start at 1, each payment thereafter increases by 1 until reaching 20, and then remain at that level until 30 payments in total are made.

5. Walker takes out a loan of 6,000,000 to start a new business. They will repay the loan with level semiannual payments of 265,044.90, with the first payment due in six months.

The loan payments are based on an annual nominal interest rate of 4.5% convertible semiannually.

Immediately after the 12th payment, the outstanding loan balance is X.

Calculate X.

6. A loan of 30,000 is being repaid with payment of 500 at the end of each month for as long as necessary plus an additional payment at the time of the last regular payment. What is the amount of the additional payment using an interest rate of 6% compounded monthly.

7. A borrower takes out a 20-year loan for 600,000, with level end-of-month payments, at an annual nominal interest rate of 9% convertible monthly.

Immediately after the 48th payment, the borrower decides to refinance the loan at an annual nominal interest rate of j, convertible monthly. The remaining term of the loan is kept at sixteen years, and level payments continue to be made at the end of the month. However, each payment is now 565.72 lower than each payment from the original loan.

Calculate j.

8. Trace takes out a loan today and repays the loan with eight level annual payments, with the first payment one year from today. The payments are calculated based on an annual effective interest rate of 6.25%. The principal portion of the fourth payment is 936.83.

Calculate the total amount of interest paid on this loan.