

MTH 351

Exam 1

Fall 2024

Show all work in a neat and organized fashion. Clearly indicate your answers.
100 points possible.

0. (4 pts.) Four free points

1. (12 pts.) At a certain rate of compound interest an investment of 2,000 will grow to 3,500 at the end of 9 years. Determine its value at the end of 16 years.

2. (12 pts.) You are given that $i^{(4)} = 0.15$. Calculate δ .

3. (12 pts.) If $a(t) = 1 + 0.005(t^3 + t)$, calculate δ_4 .

4. (12 pts.) A bank agrees to lend 20,000 now and X four years from now in exchange for a single repayment of 140,000 at the end of 10 years. The bank charges interest at an annual effective rate of 8% for the first 6 years and at a force of interest $\delta_t = \frac{1}{t+3}$ for $t \geq 6$.

Calculate X .

5. (12 pts.) Over the next 20 years, you deposit money into a retirement account at the end of each year according to the following schedule:

Time	Amount invested each year
1–10	3,000
11–15	5,000
16–20	12,000

The effective annual rate of interest is 6%. Find the accumulated value of your account at time 20.

6. (12 pts.) To accumulate 21,600 at the end of $5n$ years, deposits of 50 are made at the end of each of the first $2n$ years and 150 at the end of each of the next $3n$ years.

The annual effective rate of interest is i . You are given $(1 + i)^n = 2.0$.

Calculate i .

7. (12 pts.) Calculate the present value of an annuity immediate with 25 annual payments of 200 if the first payment of the annuity immediate starts at the end of the fourth year. The annual effective interest rate is 5%.

8. (12 pts.) Calculate the present value of an annuity due that pays 400 per month for 20 years. The annual effective interest rate is 8%.