Note: You **must** show all your work. Numerical answers without a proper explanation or a clearly written down path to the solution will be assigned zero points.

Please, provide your *complete solution* to the following problems:

Problem 5.1. (5 points) A perpetuity is payable continuously at the annual rate of $1 + t^2$ at time t. Assume that the force of interest is constant at $\delta = 0.05$. Find the present value of the perpetuity.

Problem 5.2. (5 points) Solve problem **4.6.2.** from the textbook.

Problem 5.3. (5 points) Solve problem **4.Review.2.** from the textbook.

Problem 5.4. (10 points) Solve problem **5.2.2.** from the textbook.

Problem 5.5. (10 points) Assume that compound interest is used and denote the annual discount factor by v. Find the expression for the present value of a perpetuity which pays 1 at the end of the third year, 3 at the end of the sixth year, 5 at the end of the ninth year etc. The expression you get should be a function of the discount factor v.

Problem 5.6. (5 points) Roger buys a perpetuity-immediate with annual payments. The first payment is equal to 100, and subsequent payments increase by 10.
    Harry has a level perpetuity-due with annual payments of 200.
    Under an unknown interest rate $i > 0$, the present values of the above perpetuities are equal. Find i.

Problem 5.7. (10 pts) Roger's aunt Agatha intends to invest a level amount of money equal to $\$1,000$ into a fund at the end of every year for 20 years. This fund is projected to earn an annual effective interest rate of 10%. At the end every year, aunt Agatha will have to withdraw the interest accrued during that year and reinvest it at an annual effective rate of 6%.
    Assume that aunt Agatha wants the annual yield rate of the above investment scheme to be 8% over the 20$-$year life of the investment.
    How much should she charge Roger today for the right to the above investment in order to get the yield she wants?