Formulas
You may detach this page from the exam and use it for reference.

Simple Interest

$$I = Prt \qquad F = P + Prt \qquad P = \frac{F}{1+rt} \qquad r = \frac{F-P}{Pt} \qquad t = \frac{F-P}{Pr}$$

Annual Compound Interest

$$F = P(1+r)^t \qquad P = \frac{F}{(1+r)^t} \qquad r = \left(\frac{F}{P}\right)^{1/t} - 1 \qquad t = \frac{\log \frac{F}{P}}{\log(1+r)}$$

Multiple Compounding Periods

$$F = P\left(1 + \frac{r}{n}\right)^{nt} \qquad P = \frac{F}{\left(1 + \frac{r}{n}\right)^{nt}} \qquad r = n\left[\left(\frac{F}{P}\right)^{1/nt} - 1\right]$$

$$t = \frac{\log \frac{F}{P}}{n \log \left(1 + \frac{r}{n}\right)} \qquad APY = \left(1 + \frac{r}{n}\right)^n - 1$$

This exam is *open-notes* and *open-book*. A calculator is permitted. Please show all work. If you need to continue an answer on another page or on the back of a page, please make that clear so that it can be followed by the grader.

1. **(20 points)** I borrow $1000 from the Kneecappers' Trust and Loan at an annual interest rate of 21.2%, with terms to repay the loan in full 4 years later. For each of the descriptions of the interest procedures below, calculate the quantity (in dollars) of *interest* to be paid at the end of the loan term.

    (a) The loan earns *simple interest.*

    (b) The loan earns *annually compounding interest.*

    (c) The loan earns *quarterly compounding interest.*

2. **(20 points)** How many years will it take to grow an investment of $1200 to a value of $1600 at an annual interest rate of 2.6% if the investment pays out:

    (a) Simple interest?

    (b) Annually compounding interest?

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1	/ 16
2	/ 16
3	/ 12
4	/ 16
5	/ 16
6	/ 8
7	/ 16
Σ	/100

3. **(12 points)** Series Q US Treasury Bonds earn 0.76% annual interest, compounding semian-nually. Each bond certificate has a face value of $500, to which it matures over the course of 30 years. What is the fair market price for a newly issued bond certificate?

4. **(20 points)** The C19 index fund is an investment which reliably earns an annual interest rate of 7.2%, compounding monthly. You have $600 invested in this fund.

   (a) How many months need to pass before your investment has doubled in value?

   (b) What annually-compounding interest rate would have the same yield as this fund's monthly compounding interest rate?

5. **(16 points)** Answer the following questions about percentages and change.

   (a) In the nation of Aipotu, there is no tax on food service but a 15% tip is compulsory. You end up paying $15.18 for a meal (in Aipotuan dollars, of course); how much of that was the tip?

   (b) The IBM XT personal computer cost $5000 when it was first released in 1983. The Consumer Price Index was 98.10 then, and is 147.98 now. What would the cost of the IBM XT be in inflation-adjusted dollars?

6. **(8 points)** Lagomorph Loans offers a ten-year loan of $1500 with $2500 to be repaid at the end of the loan period. What annual percentage rate (APR) are they charging?

7. **(16 points)** Anna deposits $3000 in a "rewards checking" account which pays an annual rate of 4.5% compounded monthly during months when she uses their bank-branded credit card, but which only pays an annual rate of 0.5% compounded monthly in months when she does not. For the first ten months she uses their credit card but neglects to do so for the next fourteen months. What is the balance in her account at the end of this two-year period?