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

Simple Interest
\[ I = Prt \quad F = P + Prt \]

Annual Compound Interest
\[ F = P(1 + r)^t \quad r = \left( \frac{F}{P} \right)^{1/t} - 1 \quad t = \frac{\log \frac{F}{P}}{\log(1 + r)} \]

Multiple Compounding Periods
\[ F = P \left( 1 + \frac{r}{n} \right)^{nt} \quad r = \left[ \left( \frac{F}{P} \right)^{1/nt} - 1 \right] \quad t = \frac{\log \frac{F}{P}}{n \log \left( 1 + \frac{r}{n} \right)} \]
\[ APY = \left( 1 + \frac{r}{n} \right)^n - 1 \]

This exam is closed-notes and closed-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. **(16 points)** How much would you need to invest today at 3% annual interest, compounded monthly, in order to accumulate $10,000 over the next six years?

2. **(20 points)** You have invested $2,000 in an account which pays an annual interest rate of 3.4% compounding quarterly.

   (a) What is the minimum number of quarters that this principal must be invested to be worth at least $3,200?

   (b) At the end of this full number of quarters, what is the actual value of your investment?
3. **(20 points)** A man borrows $2000 and pays off the loan three years later by paying the lender back $2400. Find the annual interest rate associated with the loan, expressed as a percentage and rounded to the nearest hundredth of a percent, in each of the following cases:

(a) The loan earns *simple interest*.

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

4. **(16 points)** A “penalty rate” loan charges 5.1% interest compounded monthly for the first year and 12.3% compounded semiannually thereafter. What would you owe if you borrowed $1100 on this loan and neglected to pay it for five and a half years?
5. **(12 points)** Sleet Bank’s savings account returns 6.2% annual interest, compounded semiannually, while an account with the Haberdasher’s Credit Union returns 6.1% compounded monthly. Which of these two accounts has a higher return on investment?

6. **(16 points)** If you invest $3,500 in your bank at a 4.5% annual interest rate, what will be the value of the account in 3 years if the bank provides:

   (a) Simple interest?

   (b) Compound interest, compounded quarterly?