

**FORMULAS**

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

**Compound Interest**

$$F = P(1 + i)^m$$

**Future Accumulation of a Periodic Payment**

$$F = A \frac{(1 + i)^m - 1}{i} \quad A = \frac{Fi}{(1 + i)^m - 1} \quad m = \frac{\log\left(1 + \frac{Fi}{A}\right)}{\log(1 + i)}$$

**Present Value of a Sequence of Payments**

$$P = A \frac{1 - (1 + i)^{-m}}{i} \quad A = \frac{Pi}{1 - (1 + i)^{-m}} \quad m = \frac{-\log\left(1 - \frac{Pi}{A}\right)}{\log(1 + i)}$$

**Balance Midway Through a Sequence of Payments**

$$P_{m_0} = A \times \frac{1 - (1 + i)^{-(m-m_0)}}{i} = P \times \frac{1 - (1 + i)^{m_0-m}}{1 - (1 + i)^{-m}}$$

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. **(35 points)** You are buying a \$110,000 house, paying 15% of the price as a down payment and taking out a 15-year mortgage with 4% annual interest with no points.

(a) What is your monthly payment? Make certain to calculate the correct loan principal first.

(b) What is the balance on the loan after two years, when you still have 13 years of payment left on the loan?

(c) What would the finance charge (total interest over the lifetime of the loan) be on this mortgage?

(d) How long (include appropriate units) will it take to pay off the loan if, from the very beginning, instead of the payment calculated in part (a), you pay \$800 per month?

FOR TA USE ONLY	
1	/ 35
2	/ 16
3	/ 12
4	/ 13
5	/ 24
6	/ (5)
$\Sigma$	/100

2. **(16 points)** A loan with a current balance of \$3000 accrues 4% annual interest compounding semiannually. You want to reduce this debt to \$1500 by making six equal payments over the course of three years. How much should you pay each half-year to achieve this goal?
3. **(12 points)** Idris owes \$2000 to be repaid in a year with four quartely payments. The loan earns an annual interest rate of 7% compounding quarterly. His **first three** payments will be for \$522.06 each. Using this information, complete the amortization table below for her loan.

Period	Balance in	Payment	Interest	Principal paydown	Balance out
1					
2					
3					
4					

4. **(13 points)** I want to fund an annuity which will pay \$200 each month for three years. The account I am using to do this pays a 3.6% annual interest rate, compounding monthly.
- (a) How much do I need to deposit initially to fund this annuity?
- (b) How much *interest* does the annuity earn over its lifetime?

5. **(24 points)** You are putting \$100 per month into a money market fund with an annual interest rate of 1.4% compounding monthly.

(a) How long (include appropriate units) will it take you to save \$20,000 in this way?

(b) How much money will you have in this account after 2 years of this process?

(c) How much have you earned in interest over these two years?

6. **(5 point bonus)** If I pay twice the required monthly payment on an amortized loan, how soon, in terms of the interest rate and ostensible lifetime of the loan, will it be paid off? You may work on the back of this sheet.