

FORMULAS

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

Compound Interest

$$F = P \left(1 + \frac{r}{n}\right)^{nt}$$

Future Accumulation of a Periodic Payment

$$F = A \frac{\left(\left(1 + \frac{r}{n}\right)^{nt} - 1\right)}{\left(\frac{r}{n}\right)} \quad A = \frac{F \times \frac{r}{n}}{\left(\left(1 + \frac{r}{n}\right)^{nt} - 1\right)}$$

Present Value of a Sequence of Payments

$$P = A \frac{\left(1 - \left(1 + \frac{r}{n}\right)^{-nt}\right)}{\left(\frac{r}{n}\right)} \quad A = \frac{P \times \frac{r}{n}}{\left(1 - \left(1 + \frac{r}{n}\right)^{-nt}\right)}$$

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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)** Borbála buys a house which costs \$175,000. She pays 30% of the price down and finances the rest with a 30-year mortgage at 5.16% annual interest with *one point*.
- (a) What is her monthly payment? Make certain to calculate the correct loan principal first.
vfillvfillvfillvfill
- (b) What is the balance on the loan twelve years later, when she still has 216 payments left?
vfillvfillvfill
- (c) Twelve years into her mortgage, when she has the balance determined in part (b), she has an opportunity to refinance, paying \$2200 in closing costs, which will be rolled into a new 30-year loan at 4.8% annual interest. Determine her new monthly payment.
vfillvfillvfillvfill
- (d) Based on the total paid over the remaining lifetime of the loan, does refinancing reduce her total repayment? Show your work.

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

2. **(12 points)** You have bought a home theater for \$2500, and have agreed to finance it at a yearly interest rate of 20.4% compounding monthly; you will be paying off your loan with three monthly payments. Your **first two** monthly payments will be for \$861.83 each. Using this information, complete the amortization table below for your loan.

Month	Balance at beginning of month	Payment	Interest paid	Principal repayment	Balance at end of month
1					
2					
3					

3. **(24 points)** You have taken out a small-business loan of \$20,000 at an interest rate of 6.4% compounded *quarterly*. You are paying back \$1500 each quarter.
- (a) How many quarters (rounded up) will it take for you to pay off the loan in its entirety?
vfillvfillvfill
- (b) How much interest total will you have paid on the loan over its lifetime?
vfillvfill

4. **(16 points)** Alice is saving money for a car; she currently has \$1250 in her “car fund” and is putting \$50 in per month for four years. Her car fund is an account earning 2.4% interest, compounded monthly. At the end of four years, how much money will there be in this account?
vfillvfill
5. **(13 points)** Ibrahim wishes to borrow money from a bank that is offering a 6% interest rate compounded monthly. He is willing to repay \$300 per month for five years.
- (a) How much money would the bank be willing to lend him on these terms?
vfillvfillvfill
- (b) How much *interest* would he pay back over the life of the loan?
vfill
6. **(5 point bonus)** As seen in class, for a loan with particular loan parameters P , r , and n , it is possible for the periodic payment to be so low that the loan will never be paid off. Find a formula on the back of the page for the threshold on the value of the periodic payment A at which it becomes impossible to pay off the loan, in terms of the parameters P , r , and n .