MA162: Finite mathematics

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SCHEDULE:

- Web Assign assignment (Chapter 5.2) due on Tuesday, December 10 by 6:00 pm.
- Web Assign assignment (Chapter 5.3) due on Friday, December 13 by 6:00 pm.
- Exam 4 on Monday, December 16, 8:30 pm to 10:30 pm.

Today is Chapter 5.3: Amortized Loans

Annuity Formulas

The future value of a simple ordinary annuity with n level payments of R dollars each period, paid at the end of each period into an account that earns interest at the rate of i per period is

$$S = R\frac{(1+i)^n - 1}{i} = Rs_{\overline{n}|i}$$

The present value of this annuity is

$$P = R\frac{1 - (1+i)^{-n}}{i} = Ra_{\overline{n}|i}$$

Amortized Loans

This final section is concerned with loans. There are two main differences between the section and the previous.

- For a loan, we take the point of view of the borrower. Thus, for a loan, we assume the person pays regular cash flows. In an annuity, we assume the person receives regular cash flows.
- For a loan, we usually assume that the total amount (either in present value or future value) is known, and we usually wish to determine the size of the regular payments.

Loan Formulas

Consider a loan with n level payments of R dollars each period, paid at the end of each period, and suppose the loan accumulates interest at the rate of i per period. Let P denote the principal (present value) of the loan and let S denote the future value of the loan. To determine the payment size, R, we can use

$$R = \frac{Si}{(1+i)^n - 1} = \frac{S}{s_{\overline{n}|i}}$$

OR

$$R = \frac{Pi}{1 - (1+i)^{-n}} = \frac{P}{a_{\overline{n}|i}}$$

Loan Example 1

You wish to buy a new car for $13,000. The car dealer offers you a 36 month loan where the interest is 2.4% compounded monthly. Assume the loan payments are to be made at the end of each month.

- Determine the size of your monthly payment.
- Determine the interest charges (look at the difference between what you borrowed and what you paid back)

Loan Example 2

You wish to buy a new home. The home costs $250,000. Your bank requires you to make a down payment of 20% of the value of the home. You will take out a loan for the remaining value of the home. The bank offers you 30 year loan where the interest rate is 7.0% per year, compounded monthly.

- Determine the size of your house payments.
- Determine the interest charges (look at the difference between what you borrowed and what you paid back)

A Savings Example

Donna wishes to save a total of $20,000 over the next 2 years. She plans on making deposits into a savings account at the end of each quarter for the next 8 quarters. The savings account pays 1.6% nominal interest per year, compounded quarterly. Determine the required size of her quarterly payments.