MA 162: Finite Mathematics

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Announcements:

- Last financial math homework due Friday at 6pm.
- See the course webpage for final exam announcements - including an opportunity to increase your score on exam #3.

Future Value of an Annuity

- F denotes the future value of the annuity (or loan)
- R denotes the payment size
- t denotes the number of years (the term of the annuity/loan)
- r is the nominal interest rate per year
- m is the number of conversion periods per year
- i is the interest rate period, so $i = r/m$
- n is the number of conversion periods in the term, so $n = mt$
- Then

$$F = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Computing the Future Value of an Annuity

Aaron recently decided to setup a retirement fund to plan for the future. He plans to deposit \$1700 into the account at the end of every 6 months until he retires 45 years from now. The retirement fund will earn 8% APR compounded semi-annually. How much money will be in the account when Aaron retires?

Relating Present and Future Values of Annuities

What is the present value of Aaron's annuity?

What does this mean?

Complex Word Problems

- The final exam will have approximately 25 points which come from complex word problems.
- Complex word problems will generally consist of multiple computations in order to get the final answer.
- You may have to use multiple formulas in a complex word problem as well.

Multiple Annuities

Helen plans to invest \$1000 at the end of every month for the next five years into an account which earns 4% APR compounded monthly. After these five years Helen plans to invest \$2500 at the end of every year for the next 30 years into an account which earns 3% APR compounded yearly. How much money does Helen have combined in the two accounts 35 years from now?

Investing to receive regular payments

Ruth is planning ahead to finance a return to school. To pay for school, Ruth wants to invest money at the end of every 6 months for the next five years into a savings account that earns 8% APR compounded semiannually. Ruth expects to withdraw $5000 semiannually during the following 4 years out the account to pay for her schooling. How much should she deposit every 6 months during the first five years?

Which loan is better?

You just bought a car for $15000. The dealership gives you two loan options:

- 5 years, 4% APR compounded monthly
- 0% APR for the first year, and 6% APR compounded monthly for the remaining 4 years

Which loan requires you to pay less in interest charges (assume that you only make payments at the end of the months when interest is applied)?

Fourth Principle of Financial Mathematics

Assume the APR of an account earning compound interest is positive.

- The numerical value of the present value is not greater than the numerical value of the future value.
- To increase the difference between the present value and the future value, you can: (a) increase the APR, (b) increase the term, (c) increase the frequency of the payments.
- Let S be the sum of the payments; i.e. $S = nR$. Then the present value is not greater than the sum of the payments.
- Doubling the size of the regular payment will: (a) decrease the term of loan by more than $1/2$, (b) decrease the interest paid by more than $1/2$.

Formulas for the Exam

- Compound Interest

$$FV = PV(1+i)^n$$

- Compounded Continuously Interest

$$A = Pe^{rt}$$

- Present Value of Annuity/Loan

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

- Future Value of Annuity/Loan

$$F = R\left[\frac{(1+i)^n-1}{i}\right]$$

- Effective Interest Rate

$$r_{eff} = \left(1+\frac{r}{m}\right)^m - 1$$