Closing Tuesday:  6.3, 6.4
Closing Thursday:  6.5
**Final exam is Saturday, December 10**
5:00pm to 7:50pm in Kane Hall 130.
You have an assigned seat, see the first entry at the top of your grade report for your assigned seat.

- **$R =$ amount of each regular payment**
- **$r =$ decimal interest rate**
- **$m =$ num. of compoundings in a year**

Compute:

- **$i = \frac{r}{m} =$ rate at each compounding**
- **$n = mt =$ total payments**

<table>
<thead>
<tr>
<th></th>
<th><strong>Ordinary</strong></th>
<th><strong>Due</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Payments at END of each period)</td>
<td>(Payments at BEGINNING of each period)</td>
</tr>
<tr>
<td><strong>FV</strong> (Balance Growing)</td>
<td>$F = R \frac{(1 + i)^n - 1}{i}$</td>
<td>$F = R \frac{(1 + i)^n - 1}{i} (1 + i)$</td>
</tr>
<tr>
<td><strong>PV</strong> (Balance Shrinking)</td>
<td>$P = R \frac{1 - (1 + i)^{-n}}{i}$</td>
<td>$P = R \frac{1 - (1 + i)^{-n}}{i} (1 + i)$</td>
</tr>
</tbody>
</table>
2. A company establishes a sinking fund to pay a debt of $100,000 due in 4 years. At the beginning of each six-month period, they deposit $R$ in an account paying 9%, compounded semi-annually. How big must the payments be to pay the debt on time?

Ordinary or Due? , FV or PV?

Ordinary or Due? , FV or PV?

3. Your retirement account earns 7%, compounded quarterly. How much must the account contain when you retire if you want to withdraw $6000 at the end of each quarter for 30 years?

Ordinary or Due? , FV or PV?

Ordinary or Due? , FV or PV?

Ordinary or Due? , FV or PV?
4. You inherit $200,000 and invest it at 3%, compounded monthly. If you withdraw $1000 at the beginning of every month, how long will the money last?

Ordinary or Due? , FV or PV?

\begin{align*}
r &= \quad , m &= \quad , t = \\
i &= \quad , n &= \\
R &= \quad , FV/PV = 
\end{align*}
Chapter 6 Summary

1. Are there regular payments?
   (a) NO: it’s a LUMP SUM problem.
   (b) YES: it’s an ANNUITY problem.

2(a) For LUMP SUM, does it say:
   (i) "simple interest"?
   (ii) "compound continuously"?
   (iii) "compounded m times a year"

2(b) For ANNUITIES,
   (i) payments at BEGINNING or END?
   (ii) balance GROWING or SHRINKING?

Special notes on Annuities:
1. Always first compute
   \[ i = \frac{r}{m} \] = rate used at each period.
   \[ n = mt \] = total number of payments

2. Since
   \[ R = \text{payment amount}, \quad n = \text{total number of payments} \]
   we have
   \[ R \cdot n = \text{total amount paid}. \]

   Thus, for FV questions
   \[ \text{Total interest earned} = F - R \cdot n \]
   and for PV questions
   \[ \text{Total interest paid} = R \cdot n - P \]

3. Loans are present value, ordinary annuities. If there is a down payment on a loan, then
   \[ P = \text{original value} - \text{down payment} \]
Homework Question 6.3 Problem 7(a)(b):
A small business owner contributes $2000 at the end of each quarter to a retirement account that earns 10% compounded quarterly.
(a) How long will it be until the account is worth $150,000?
(Round your answer to the nearest quarter.)

(b) Suppose when the account reaches $150,000, the business owner increases the contributions to $4000 at the end of each quarter. What will the total value of the account be after 15 more years?
Immediately after graduating from college, Julian started a savings plan, depositing $200 at the end of each month in an account paying 3% interest, compounded monthly. After 6 years, Julian stopped making payments but left the money in the account, gaining interest at the same rate, for an additional 4 years.

(a) How much money is in the account in 6 years?

(b) How much money is in the account in 10 years?