Section 11.3 (Homework)

#7. \( A = p \left(1 + \frac{r}{n}\right)^{nt} \)

$2000 for 3 years at 2\% compounded annually

\[ p = 2000, \quad t = 3, \quad r = 2\% = 0.02, \quad n = 1 \]

a) \[ A = 2000 \left(1 + \frac{0.02}{1}\right)^3 \]

\[ = 2000 \left(1 + 0.02\right)^3 = \$2122.42 \]

b) Compound interest: \( i = A - p \)

\[ = 2122.42 - 2000.00 \]

\[ = \$122.42 \]
#33. Effective annual yield. (Annual percentage yield) (APY)

Always use #1. for 1 year

\[ APY = \left(1 + \frac{r}{n}\right)^{n(1)} - 1 \] (convert to %)

Here \( r = 3.5\% = 0.035 \)

\( n = 2 \) (compounded semiannually)

\[ APY = 1 \left(1 + \frac{0.035}{2}\right)^{2(1)} - 1 \]

\[ = \left(1 + \frac{0.035}{2}\right)^2 - 1 = 0.0353 \approx 3.53\% \]

\[ \frac{0.035}{2} \]

(Texas Instruments TI-83 Plus calculator)

\[ (1 + 0.035/2)^2 - 1 \]

\[ 0.03530625 \]
#21.

\[ P = 800 + 150 + 300 + 1000 = 2250 \]

\[ r = 2\% = 0.02 \]

\[ t = 24 \text{ months} = 2 \text{ years} \]

\[ n = 360 \text{ (compounded daily)} \]

\[ A = P \left(1 + \frac{r}{n}\right)^{nt} \]

\[ A = 2250 \left(1 + \frac{0.02}{360}\right)^{720} \]

\[ = 2250 \left(1 + \frac{0.02}{360}\right)^{720} \approx 2341.82 \]
If you want to have a certain amount of money $A$ in $t$ years, the amount $p$ which would have to be invested now is called the **present value**.

\[
p = \frac{A}{(1+\frac{r}{n})^{nt}}
\]

with \[ p = \text{present value} \]

\[ A = \text{amount of money required in the future} \]
4. Buddy wants to invest some money now to buy a new tractor in the future. If he wants to have $30,000 available in 5 years, how much does he need to invest now in a CD paying 5.15% interest compounded monthly?

\[
A = \$30,000, \quad r = 5.15\% = 0.0515
\]

\[
t = 5, \quad n = 12
\]

\[
P = \frac{A}{(1 + \frac{r}{n})^{nt}} = \frac{30,000}{(1 + \frac{0.0515}{12})^{60}}
\]

\[
= \frac{30,000}{(1 + \frac{0.0515}{12})^{60}}
\]

\[
= \$23,202.23
\]

Finish Section 11.3 homework
In 1626 Peter Du Minuit, representing the Dutch West India Company, traded beads and blankets to the native American inhabitants of Manhattan Island for the island. The trade was valued at 60 Dutch guilders, about $24. If at that time the $24 had been invested at 6% interest compounded annually, the investment would be worth about $88,273,086,435 in 2004. As a comparison, had the $24 been invested for the 378 years in a 6%

simple interest account, the investment would be worth only $568.32. Had the $24 been invested in a continuously compounded interest account at 6%, the investment would be worth about $169,828,311,335. These results dramatically demonstrate the power of compounding interest over time.
11.4 Installment Buying

Open-end installment loan is a loan on which you can make variable payments each month. (ex. Credit cards)

Fixed installment loan is one on which you pay a fixed amount of money for a set number of payments. (ex. Student loans, car loans)

Annual percentage rate (APR) is the true rate of interest charged for the loan.
Finance charge is the total amount of money the borrower must pay for its use. (Includes interest plus any additional fees.)

Total installment price is the sum of all the monthly payments and the down payment, if any.
Fixed Installment Loans

Example:

1. Remodeling a Living Room. Oda Lisa Hernandez received a bid of $4200 to remodel her living room. To finance this amount, her savings and loan requires her to pay 15% down, with the balance being financed with a 24-month installment loan with an APR of 7.5%.
   a.) Determine Oda’s total finance charge.
   b.) Determine Oda’s monthly payment.

   __________
   Down payment: 15% of $4200 \times 0.15(4200) = $630.00

   Amount of loan: $4200 - 630 = $3570.00
Johnny will have 24 monthly payments of $201.47.

<table>
<thead>
<tr>
<th>Number of Payments</th>
<th>3.0%</th>
<th>3.5%</th>
<th>4.0%</th>
<th>4.5%</th>
<th>5.0%</th>
<th>5.5%</th>
<th>6.0%</th>
<th>6.5%</th>
<th>7.0%</th>
<th>7.5%</th>
<th>8.0%</th>
<th>8.5%</th>
<th>9.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.88</td>
<td>1.02</td>
<td>1.17</td>
<td>1.32</td>
<td>1.46</td>
<td>1.61</td>
<td>1.76</td>
<td>1.90</td>
<td>2.05</td>
<td>2.20</td>
<td>2.35</td>
<td>2.49</td>
<td>2.64</td>
</tr>
<tr>
<td>12</td>
<td>1.63</td>
<td>1.91</td>
<td>2.18</td>
<td>2.45</td>
<td>2.73</td>
<td>3.00</td>
<td>3.28</td>
<td>3.56</td>
<td>3.83</td>
<td>4.11</td>
<td>4.39</td>
<td>4.66</td>
<td>4.94</td>
</tr>
<tr>
<td>18</td>
<td>2.39</td>
<td>2.79</td>
<td>3.20</td>
<td>3.60</td>
<td>4.00</td>
<td>4.41</td>
<td>4.82</td>
<td>5.22</td>
<td>5.63</td>
<td>6.04</td>
<td>6.45</td>
<td>6.86</td>
<td>7.28</td>
</tr>
<tr>
<td>24</td>
<td>3.15</td>
<td>3.69</td>
<td>4.22</td>
<td>4.73</td>
<td>5.29</td>
<td>5.83</td>
<td>6.37</td>
<td>6.91</td>
<td>7.45</td>
<td>8.00</td>
<td>8.54</td>
<td>9.09</td>
<td>9.64</td>
</tr>
<tr>
<td>36</td>
<td>4.69</td>
<td>5.49</td>
<td>6.29</td>
<td>7.09</td>
<td>7.90</td>
<td>(8.71)</td>
<td>9.52</td>
<td>10.34</td>
<td>11.16</td>
<td>11.98</td>
<td>12.81</td>
<td>13.64</td>
<td>14.48</td>
</tr>
<tr>
<td>48</td>
<td>6.24</td>
<td>7.31</td>
<td>8.38</td>
<td>9.46</td>
<td>10.54</td>
<td>11.63</td>
<td>12.73</td>
<td>13.83</td>
<td>14.94</td>
<td>(16.06)</td>
<td>17.18</td>
<td>18.31</td>
<td>19.45</td>
</tr>
</tbody>
</table>

\[ \text{Total finance charge} = \frac{\text{Amount of loan}}{100} \times \text{(number from table)} \]

\[ \frac{3570}{100} \times 8.01 = \$285.60 \]

\[ \text{Total finance charge} \]
Total amount to be repaid = Amount of loan + Total finance charge

= 3570.00 + 285.60 = $3855.60

Monthly payment = $3855.60 \div 24 = $160.65
2. Financing a Computer. Gilberto Garza purchased a computer on a monthly payment plan. The computer sold for $2350. He paid $500 down and $83.67 a month for 24 months.
   a.) What finance charge did Gilberto pay?
   b.) What is the APR to the nearest half a percent?

\[
\text{Amount of loan} = 2350 - 500 = 1850.
\]

\[
\text{He repaid} (\$83.67 \times 24) = 2008.08
\]

\[
\text{Total finance charge} = 2008.08 - 1850 = 158.08
\]
b) Find APR: \[ \frac{\text{Amount of loan}}{100} \times \text{number from table} = \text{Total finance charge} \]

\[ \frac{1850}{100} \times N = 158.08 \]

\[ 18.5 \times \frac{158.08}{18.5} \text{ or } N = \frac{158.08}{18.5} = N = 8.54 \]

Given: 24 months

Johnny will have 24 monthly payments of $201.47.

**TABLE 11.2** Annual Percentage Rate Table for Monthly Payment Plans

<table>
<thead>
<tr>
<th>Number of Payments</th>
<th>Annual Percentage Rate (Finance charge per $100 of amount financed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>3.0% 1.02 1.17 1.32 1.46 1.61 1.76 1.90 2.05 2.20 2.35 2.49 2.63</td>
</tr>
<tr>
<td>12</td>
<td>1.63 1.91 2.18 2.45 2.73 3.00 3.28 3.56 3.83 4.11 4.39 4.66 4.93</td>
</tr>
<tr>
<td>18</td>
<td>2.39 2.79 3.20 3.60 4.00 4.41 4.82 5.22 5.63 6.04 6.47 6.86 7.28</td>
</tr>
<tr>
<td>24</td>
<td>3.15 3.69 4.22 4.75 5.29 5.83 6.37 6.91 7.45 8.00 8.54 9.09 9.64</td>
</tr>
<tr>
<td>60</td>
<td>7.81 9.15 10.50 11.86 13.23 14.61 16.00 17.40 18.81 20.23 21.66 23.10 24.54</td>
</tr>
</tbody>
</table>

**APR = 8%**
3. Average Daily Balance Method. The Levy’s card statement shows a balance due of $1578.25 on March 23, the billing date. For the period ending April 23, they had the following transactions:

March 26       Charge: Party supplies       $79.98  
March 30       Charge: Restaurant meal      52.76  
April 3        Payment                       250.00  
April 15       Charge: Clothing             190.52  
April 22       Charge: Car repairs          190.85  

a.) Find the average daily balance for the billing period.

b.) Find the finance charge to be paid on April 23. Assume an interest rate of 1.3% per month.

c.) Find the balance due on April 23.
<table>
<thead>
<tr>
<th>DATE</th>
<th>CHARGE</th>
<th>PAYMENT</th>
<th>BALANCE</th>
<th>CHARGE</th>
<th>BALANCE</th>
<th>CHARGE</th>
<th>NO. OF DAYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 23</td>
<td></td>
<td></td>
<td>1578.25</td>
<td>3</td>
<td>4734.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mar. 26</td>
<td>79.98</td>
<td></td>
<td>1658.23</td>
<td>4</td>
<td>6632.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mar. 30</td>
<td>52.76</td>
<td></td>
<td>1710.99</td>
<td>4</td>
<td>6843.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apr. 3</td>
<td>252.00</td>
<td></td>
<td>1460.99</td>
<td>12</td>
<td>19531.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apr. 15</td>
<td>190.52</td>
<td></td>
<td>1651.51</td>
<td>7</td>
<td>11560.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apr. 22</td>
<td>190.85</td>
<td></td>
<td>1842.36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apr. 23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1842.36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total: 4946.44
Average Daily Balance = \frac{49146.44}{31} = \$1585.37

Finance charge = (1585.37)(.013)(1) = \$20.61

Balance owed on April 23 = last balance + finance charge

= 1842.36 + 20.61 = \$1862.97