So the ending property price must be
110,000 + 84,465.07 = 194,465.07

To compute the rate of appreciation treat it as the return from a PV to an FV.

\[ \frac{1}{1 + r} \left( \frac{FV}{PV} \right)^n - 1 = \left( \frac{194,465.07}{110,000} \right)^{1/5} - 1 \]

= 12.08% per year for 5 years to achieve the desired return.

#7 PL/114 | 100,000 30 yr loan at 12% with PMT = 800

\( a \) Loan Bal 0 = \frac{P}{1 + \text{INPUT 60 } \text{AMORT} } \to \text{BAL} = 116,333.93

Loan Bal 360 = 1 \text{INPUT 360 } \text{AMORT} \to \text{BAL} = 798,992.83

Set calculator to \( I/Y = 12 \)
PV = -100,000, I/Y = 12, PMT = 800

\( b \) Year 1 Interest paid, Interest Deferred.
Interest paid = 800 * 12 = 9600
Interest deferred is the accrued principal
1 \text{INPUT 12 } \text{AMORT } \to \text{PRIN} = 2536.70

Year 5: Interest paid = 9600
Interest Deferred: 49 \text{INPUT 60 } \text{AMORT } 
\to \text{PRIN} = 4089.41
Chapter 7: Residential Financial Analysis

I. Incremental Borrowing Cost - How much does it cost to borrow "a bit more"? i.e. Marginal Interest Rate.

II. When to refinance a loan. Have interest rates fallen enough so that it's in my best interest to refinance? (This is a very difficult problem to solve correctly).

III. Market Value of a Mortgage -
- The market value of a mortgage is the PV of its remaining payments; it would be a fluke if this equaled the note balance.
- It depends heavily on the prepayment assumption.

IV. What is the value or cost to buying down a mortgage?
Example of Incremental Borrowing Cost

1) 100,000 House
   Can get an 80,000 loan @ 8% 25 yr
   90,000 loan @ 8.5% 25 yr

What is the incremental cost on the loan $10,000?

Strategy - Compute your extra payment to get an extra $10,000. What is the IRR for this deal?

\[
PMT_A \left( PV = -80,000, N = 300, \text{ I}14\% = 8\% \right) = 617.45
\]

\[
PMT_B \left( PV = -90,000, N = 300, \text{ I}14\% = 8.5\% \right) = 724.70
\]

Incremental Payment = 724.70 - 617.45 = 107.25

Incremental Amount Borrowed = 10,000

\[
\text{IRR} \left( PV = -10,000, PMT = 107.25, N = 300 \right) = 12.26\%
\]
b) What if there are 2 points on the 90% loan?
Note: The payments remain the same, but the cash disbursed by the lender declines.
Now, if you get the 90% loan, the lender disburses 0.98 x 90,000 = 88,200
The incremental amount you borrowed is 8,200.

\[ I_{1YR} (PV = -8,200, PMT = 107.25, N = 300) = 15.35\% \]

(c) How does the answer to B change if you only stay in the house 5 yr. We need to know the difference in loan balance. The we will repay 5 years from now.
For A: \( BAC_{60} = 73,819.15 \)
For B: \( BAC_{60} = 83,508.29 \)
So we pay back 9689.14 more after 5 yr.
For loan B
\[ I_{1YR} (PV = -8200, N = 60, PMT = 107.25, FV = 9689.14) = 17.96\% \]
A: $220,000 loan @ 9.5% 20 yr
B: $180,000 loan @ 9.6% 20 yr
  $40,000 loan @ 13.0% 20 yr

1) For a person who keeps the mortgage
   the entire term, simply choose lowest
   payment (P/YR = 12)

   \[ PMT_A \ (PV = -220,000, \ I/YR = 9.5, \ N = 240) \]
   \[ = 2050.69 \]

   \[ PMT_{B1} \ (PV = -180,000, \ I/YR = 9, \ N = 240) \]
   \[ = 1619.51 \]

   \[ PMT_{B2} \ (PV = -40,000, \ I/YR = 13, \ N = 240) \]
   \[ = 468.63 \]

   \[ PMT_B = 1619.51 + 468.63 = 2088.14 \]
   which is higher so choose A.

   Combined Rate or Yield on B

   \[ I/YR \ (PV = -220,000, \ PMT = 2088.14, \ N = 240) \]
   \[ = 9.76\% \] which is higher than A.
Depending on next week's progress - midterm exam may be postponed.

P 203 #2

b) What if you move after 5yr?

\[ \text{BAL A at month 60} = 196,383.85 \]
\[ \text{BAL B}_{1} = 159,672.69 \]
\[ \text{BAL B}_{2} = 37,038.78 \]
\[ \frac{159,672.69}{3} = 196,711.47 \]

For A: I/YR\((PV = -220,000, PMT = 2050.69, N = 60, FV = 196,383.85)\)

\[ = 9.5\% \]

For B: I/YR\((PV = -220,000, PMT = 2088.14, N = 60)\)

\[ FV = 196,711.47 \]

\[ = 9.74\% \]

So option A still appears to be best.

c) What if the second mortgage has a 10yr term?

\[ \text{PMT B}_{2} \text{ (PV = -49,080, N = 120, I/YR = 13)} = 597.24 \]

Combined PMT for first 10yr: 1619.51 \(1st\)
597.24 \(2nd\)
\[ 2216.75 \text{ tot} \]
To calculate the effective interest cost need to do CF Calculation

<table>
<thead>
<tr>
<th>t</th>
<th>CFj</th>
<th>Nj</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-220,000</td>
<td></td>
</tr>
<tr>
<td>1-60</td>
<td>2216.75</td>
<td>60</td>
</tr>
<tr>
<td>61-120</td>
<td>2216.75</td>
<td>60</td>
</tr>
<tr>
<td>121-180</td>
<td>1619.51</td>
<td>60</td>
</tr>
<tr>
<td>181-240</td>
<td>1619.51</td>
<td>60</td>
</tr>
</tbody>
</table>

IRR (IRR) = 7.49

which is less than 9.5%

However - if you were willing to make the higher payments you probably could have taken a 15yr first mortgage for less than 9.5%

Say for example you could get 9.25% for 15 yr on a first mortgage. Then your payment would be:

\[ \text{PMT} \left( \text{PV} = -220,000, i = 9.25\%, n = 180 \right) \]
\[ = 22,642.22 \] which is not much more than the first 10yr of PMTs for the above option and a lower overall interest cost.