Solutions and answers of the homework problems in Chapter 3

3.1.8. 209%, $\frac{60}{360} = \frac{1}{6} = 0.167$ years.

3.1.12. We have $I = 15$, $r = 0.08$, and $t = \frac{3}{4} = 0.75$. Then

$$P = \frac{I}{rt} = \frac{15}{(0.08)(0.75)} = \$250$$

3.1.16. $t = \frac{I}{Pr} = \frac{96}{(3200)(0.04)} = 0.75$ years (or 3 quarters).

3.1.22. $A = P(1 + rt)$ and thus $r = \frac{A-P}{Pt} = \frac{3{,}135}{(19000)(39/52)} = \frac{3{,}135}{14{,}250} = 0.22$ or 22%.

3.1.30. $t = \frac{I}{Pr}$.

3.1.34. $P = \$5,000$, $r = 0.062$, $t = 3/4 = 0.75$ years. Therefore $I = Prt = 5,000(0.062)(0.75) = \$232.50$

3.1.38. $P = \$10,000$, $r = 0.065$, $t = 1/2 = 0.5$ years. Therefore

$$A = P(1 + rt) = 10,000(1 + 0.065(0.5)) = \$10,325.00$$

3.1.52. The amount the investor has earned is $I = 11,070 - 184.49 = \$10,885.51$. Then

$$r = \frac{I}{Pt} = \frac{1,083.69}{9,801.82\left(\frac{1}{2}\right)} = 0.22112 \text{ or } 22.112\%$$

3.2.20. We have $i = \frac{r}{m} = \frac{0.1095}{365} = 0.0003$ or 0.03%

3.2.24. We have $i = \frac{r}{m} = \frac{0.05}{4} = 0.0125$ or 1.25%

3.2.28. We have $i = \frac{r}{m}$ and thus $r = im = 0.0675(1) = 0.0675$ or 6.75% (notice that $i = r$ because $m = 1$).

3.2.34. (A) $A = (1 + i)^n = 2,000(1.07)^5 = \$2,805.10$. The interest is: $2,805 - 2,000 = \$805.10$

(B) The interest is $2,829.56 - 2000 = \$829.56$

(C) The interest is $2,835.25 - 2000 = \$835.25$

3.2.48. (A) $APY = (1 + \frac{r}{m})^m - 1 = \left(1 + \frac{0.062}{2}\right)^2 - 1 = 0.063$ or 6.3%

(B) $APY = (1 + \frac{r}{m})^m - 1 = \left(1 + \frac{0.071}{12}\right)^1 2 - 1 = 0.0731$ or 7.31%

3.2.54. (solved in class) We have $P = 42,000$, $A = 60,276$, and $r = 0.0425$. By the formula $A = Pe^{rt}$ we find $60,276 = 42,000e^{0.0425t}$. Therefore $0.0425t = \ln(\frac{60,276}{42000})$ and

$$t = \frac{1}{0.425}\ln(\frac{60,276}{42000}) = \frac{0.3613}{0.0425} = 8.5 \text{ years.}$$

3.2.62. We have $P = 14,000$, $n = 6$ $m = 2$, and $r = 0.065$. Then

$$A = P\left(1 + \frac{r}{m}\right)^n = 14,000\left(1 + \frac{0.065}{2}\right)^6 = \$16961.66$$

3.2.74. The formula is $A = Pe^{rt}$ and we have $A = 12,500$, $P = 10,000$, and $t = 4$. Then $12,500 = 10,000e^{4r}$ and $e^{4r} = 1.25$. Therefore $r = \frac{\ln 1.25}{4} = 0.0558$ or 5.58%

3.3.16. $PMT = FV\frac{i}{(1+i)^n-1} = 2,500\frac{0.08}{(1.08)^{10}-1} = \$172.57$

3.3.18. $n = \frac{\ln 1.64}{\ln 1.04} \approx 13$ periods.

3.3.28. $PMT = FV\frac{i}{(1+i)^n-1} = 120,000\frac{0.034}{(1+0.034)^{30}-1} = \$2,363.07$

3.3.32. $FV = 500\frac{\left(1+\frac{0.08}{4}\right)^4-1}{\frac{0.08}{4}} \approx \$2,060.80$

Interest earned $= 2,060.80 - 2000.00 = \$60.80$

At the end of the second year: $FV = \$4,291.48$

Total deposits plus interest in the second year: $4,291.48 - 2,060.80 = \$2,230.68$

Interest earned in the second year $= 2,230.68 - 2000.00 = \$230.68$

At the end of the third year: $FV = \$6,706.04$

Total deposits plus interest in the third year: $6,706.04 - 4,291.48 = \$2,414.56$

Interest earned in the third year $= 2,414.56 - 2000.00 = \$414.56$

3.3.38. (A) $r = 12[(1.0565)^{1/12} - 1] = 0.05508 \approx 0.0551$ or 5.51%.

(B) $PMT = 1,000,000\frac{\frac{0.0551}{12}}{\left(1+\frac{0.0551}{12}\right)^{96}-1} = \$8,312.47$

3.3.42. (will be solved in class using technology) We have $PMT = 2,000$, $FV = 14,000$, $n = 6$, $m = 1$, and $r = i$. Then by the formula $FV = PMT\frac{(1+i)^n-1}{i}$ we find $14,000 = 2,000\frac{(1+r)^6-1}{r}$ and thus $7 = \frac{(1+r)^6-1}{r}$. We graph the functions $Y_1 = \frac{(1+x)^6-1}{x}$ and $Y_2 = 7$ and locate the intersection point in the interval $[0, 1]$. This point is $x = 0.0614$. Thus, $r = 6.14\%$

3.4.18. $n = -\frac{\ln 0.3}{\ln 1.0175} = 69.4$ or $n \approx 70$

3.4.24. $PV = 350\frac{1-\left(1+\frac{0.984}{12}\right)^{-12}}{\frac{0.984}{12}} = \$10,872.23$
Total interest $= 36(350) - 10,872.23 = \$1,727.77$

3.4.32. $PMT = 72,000\frac{\frac{0.925}{12}}{1-\left(1+\frac{0.925}{12}\right)^{-84}} = \$1,167.57$
Total interest $= 84(1,167.57) - 72,000 = \$26,075.88$

3.4.38. $PMT = 96,000\frac{\frac{0.075}{12}}{1-\left(1+\frac{0.075}{12}\right)^{-360}} = \$672.25$
Total interest $= 360(672.25) - 96,000 = \$145,650$

3.4.42.

(A) Balance after 5 years $= 393.67\frac{1-(1+0.006)^{-180}}{0.006} = \$43,258.22$

(B) Balance after 10 years $= 393.67\frac{1-(1+0.006)^{-120}}{0.006} = \$33,606.26$

(C) Balance after 15 years $= 393.67\frac{1-(1+0.006)^{-60}}{0.006} = \$19,786.69$

3.4.50.

Amortized amount: $100,000 - (0.20)(100,000) = \$80,000$
$PMT = 80,000\frac{0.008}{1-(1.008)^{-360}} = \$678.53$

Balance after 10 years $= 678.53\frac{1-(1.008)^{-240}}{0.008} = \$72,286.24$
New loan amount is $(0.80)(136,000) = \$108,800$
Thus the cash the owner will receive will be $108,800 - 72,286.24 = \$36,514$