6.2 For an investment that doubles every 6 months when interest is compounded semiannually, the effective rate of return per 6-months is 100%. Therefore, the nominal return per year is $2 \times 100 = 200\%$.

6.4 Amount due after 1 month = $300,000(1.007) = $302,100
Balance after $50,000 payment = 302,100 – 50,000
= $252,100

6.5 Solve equation by trial and error or Excel:

\[ 0 = -50,000 + 15,000(P/A,i,4) + 9,000(P/F,i,4) \]

Try i = 12\%: $50,000 + 15,000(3.0373) + 9000(0.6355) = $1279 \quad \text{i too low}
Try i = 14\%: $50,000 + 15,000(2.9137) + 9000(0.5921) = $(965.60) \quad \text{i too high}

By interpolation, \( i = 12\% + $1,279/($1,279 – (-$965)) \times 2\% = 13.14\% \)

EXCEL:
\[
\begin{array}{cccccc}
\text{A} & \text{B} & \text{C} & \text{D} & \text{E} \\
\text{Row} 1 & -50000 & 15000 & 15000 & 15000 & 24000 \\
\end{array}
\]

\[ =\text{IRR(A1:E1,.1)} = 13.1223\% \]

6.9 \[ 0 = -65,220(P/A,i,4) + (57,925 – 35,220)(P/A,i,31)(P/F,i,4) \]
\[ 0 = -65,220(P/A,i,4) + (22,705)(P/A,i,31)(P/F,i,4) \]

Solve by trial and error:
Try 6\%: 0 = -225,994 + 250,510 = $24,516 \quad \text{i too low}
Try 7\%: 0 = -220,913 + 217,071 = $(3842) \quad \text{i too high}

\[ i = 6\% + $24,516/($24,516 – (-$3,842)) \times 1 = 6.8645\% \text{ per year (interpolation)} \]

\[ i = \text{IRR(A1:AI1,.1)} = 6.8508\% \text{ per year} \quad \text{(spreadsheet)} \]

6.19 The alternative with the higher rate of return may not be the best alternative when the initial investment is less than the total money available for investment. In some cases, the weighted average ROR on the total amount available for investment can be higher when the lower ROR alternative is selected.

6.37

(a) Initial cost Machine 1:
\[ -$60,000 – (-x) = -$16,000; \text{ therefore } x = -$60,000 - (-$16,000) = -$44,000. \]

Overall ROR Machine 2: \[ 0 = -$60,000 + 16,000(P/A,i*,10) \]
\[
\begin{array}{cccccccccccc}
\text{A} & \text{B} & \text{C} & \text{D} & \text{E} & \text{F} & \text{G} & \text{H} & \text{I} & \text{J} & \text{K} \\
\text{Row} 1 & -60000 & 16000 & 16000 & 16000 & 16000 & 16000 & 16000 & 16000 & 16000 & 16000 \\
\end{array}
\]

\[ i* = \text{IRR(A1:K1,.1)} = 23.4131\% \]
Incremental investment $3:2$: $-72,000 - (-60,000) = -$12,000
Incremental cash flow $4:3$: $24,000 - 19,000 = $5000$
Incremental ROR $3:2$: $0 = -12,000 + 3000(P/A, i^*, 10)$, $i^* = 21.4\%$
Incremental ROR $4:3$: $0 = -26,000 + 5000(P/A, i^*, 10)$, $i^* = 14.1\%$

(b) Machines are ranked according to initial investment cost;
   Compare 2 vs 1: ROR = 35.7\% > MARR, eliminate 1
   Compare 2 vs 3: ROR = 21.4\% > MARR, eliminate 2
   Compare 3 vs 4: ROR = 14\% > MARR, keep 3

Select Machine 3

6.45 (a) one  (b) three  (c) seven