1. a) eff(5,2) ⇒ 5.0625%
b) eff (5,4) ⇒ 5.0945%
c) eff (5,12) ⇒ 5.1162%
d) eff (5,365) ⇒ 5.1267%

2. a) N = 45 PMT = ? $\xrightarrow{\text{solve}}$ $2587.28
I = 8 FV = 1000000
PV = 0 P/Y = 1
b) 1,000,000 − 45 * 2587.28 = $883,572.4

3. a) N = 18 PMT = 0 $\xrightarrow{\text{solve}}$ $16,899.66
I = 7 FV = ?
PV = 5000 P/Y = 1
b) N = 18*365 = 6570, P/Y = 365 → $17,624.98
c) Pert → $5000e^{(.07*18)}$ = $17,627.12

4. N = 5×12 = 60 PMT = 350 → $16,860.68
I = 9 FV = 0 loan amt
PV = ? P/Y = 12
if I = 1, PV = $20,475.32

5. N = ? PMT = −500 (not −21.75!!)
I = 9 FV = 10000 N = 18.7 ⇒ 19 months
PV = 0 P/Y = 12 (round up)

6. N=?
I = 21
PV = -2500

PMT = 50
FV = 0
P/Y = 12

$\Rightarrow$ N = 119.86
$\Rightarrow$ 120 months
or 10 years

7 a) N = 360
I = 6.9
PV = 130000

PMT = ?
FV = 0
P/Y = 12

$\Rightarrow$ PMT is \$856.18

b) 360(856.18) - 130,000 = \$178,224.80

c) N = 360 - 180 = 180
I = 6.9
PV = ?

PMT = 856.18
FV = 0
P/Y = 12

$\Rightarrow$ PV = 95850.35 (still owe bank)

EQ = 150,000 - 95850.35 = \$54,149.65

d) 1st PMT: 130,000 * .069/12 = \$747.50 interest
856.18 - 747.50 = \$108.68 to pay off loan
2nd month: owe 130,000 - 108.68 = 129,891.32
Interest owed: 129891.32 * .069/12 = \$746.88
To principal: 856.18 - 746.88 = \$109.30

1 a) Regular – a transition matrix & no zeros
b) Not a TM – col 2 > 1
c) Not regular – an absorbing TM

2. a)

$$\begin{array}{c|cc} & IN & OUT \\ \hline IN & .5 & .65 \\ out & .5 & .35 \end{array} \quad \text{OR} \quad \begin{array}{c|cc} & OUT & IN \\ \hline OUT & .35 & .5 \\ IN & .65 & .5 \end{array}$$

b) $T^2 X_0 = \begin{bmatrix} .5 & .65 \\ .5 & .35 \end{bmatrix}^2 \begin{bmatrix} .25 \\ .75 \end{bmatrix} = \begin{bmatrix} .558125 \\ .441875 \end{bmatrix} \begin{matrix} IN \\ OUT \end{matrix}$

44.1875% chance of out of state vacation

c) $TX_L = X_L$

$$\begin{bmatrix} .5 & .65 \\ .5 & .35 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix} \Rightarrow \begin{matrix} .5x + .65y = x \\ .5x + .35y = y \end{matrix}$$

$$\Rightarrow \begin{matrix} -.5x + .65y = 0 \\ .5x - .65y = 0 \\ x + y = 1 \end{matrix} \overset{RREF}{\Rightarrow} \begin{matrix} x = 13/23 \approx .5652 \\ y = 10/23 \approx .4348 \end{matrix}$$

Long term is 13/23 probability of in-state ($\approx$ 56.52%) and 10/23 probability of out of state ($\approx$ 44.48%) vacation

3. $\left[\begin{array}{c|c} I & S \\ \hline 0 & R \end{array}\right] \Rightarrow$

$$\begin{array}{c|cc|cc} & \text{Paid} & \text{Bad} & <30 & <60 \\ \hline \text{Paid} & 1 & 0 & 1/3 & 1/6 \\ \text{Bad} & 0 & 1 & 0 & 1/6 \\ \hline <30 & 0 & 0 & 1/3 & 1/3 \\ <60 & 0 & 0 & 1/3 & 1/3 \end{array}$$

S R

$$\overset{[A]}{S}\,\overset{[B]}{(I-R)}^{-1} = \begin{array}{c} \\ \text{Paid} \\ \text{Bad} \end{array} \begin{array}{cc} <30 & <60 \\ \left[\begin{array}{cc} 5/6 & 2/3 \\ 1/6 & 1/3 \end{array}\right] \end{array}$$

If < 30, 5/6th chance it is paid off and 1/6 it is bad
If < 60, 2/3 chance it is paid off and 1/3 it is bad

$$F = (I-R)^{-1} = \begin{array}{c} \\ <30 \\ <60 \end{array} \begin{array}{cc} <30 & <60 \\ \left[\begin{array}{cc} 2 & 1 \\ 1 & 2 \end{array}\right] \end{array}$$

Starting in <30, spend ≈ 2 turns <30 and 1 turn in <60. So about 3 turns before absorbed

Starting in <60, spend ≈ 1 turn in <30, 2 turns in <60. About 3 turns before absorbed