202 Homework #2 key

1. $A = \begin{bmatrix} .95 & .05 & .15 \\ .01 & .88 & .20 \\ .04 & .07 & .65 \end{bmatrix}$ $\vec{x}_0 = \begin{bmatrix} 295 \\ 55 \\ 400 \end{bmatrix}$ Monday

$\vec{x}_1 = A\vec{x}_0$ Tuesday $\quad x_2 = A\vec{x}_1 = A^2\vec{x}_0$ Wednesday

$X_2 = \begin{bmatrix} 373.765 \\ 174.148 \\ 202.087 \end{bmatrix} \approx \begin{bmatrix} 374 \\ 174 \\ 202 \end{bmatrix}$ 374 cars at west, 174 at North and 202 at East

$\vec{x}_3$ = Thursday, $\vec{x}_4$ = Friday, $\vec{x}_5$ = Saturday, $\vec{x}_6$ = Sunday $\vec{x}_7$ = Monday

$\vec{x}_7 = A^7 x_0 = \begin{bmatrix} 431.1623988 \\ 216.50700086 \\ 102.3305926 \end{bmatrix} \approx \begin{bmatrix} 431 \\ 217 \\ 102 \end{bmatrix}$ 431 at West, 217 at North, 102 at East

2a. i. $A^T = \begin{bmatrix} 3 & -1 \\ 1 & 4 \end{bmatrix}$ iii. $G^T = \begin{bmatrix} 6 & 11 & 2 \\ -7 & -5 & 3 \end{bmatrix}$

ii. $D^T = \begin{bmatrix} 1 & -2 & 3 \\ 3 & 1 & -4 \\ 4 & 0 & 1 \end{bmatrix}$ iv. $J^T = \begin{bmatrix} 4 & -1 \end{bmatrix}$

b. i. $A^{-1} = \frac{1}{12+1}\begin{bmatrix} 4 & -1 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} 4/13 & -1/13 \\ 1/13 & 3/13 \end{bmatrix}$

ii. C^{-1} = does not exist (det is zero)

iii. $D^{-1} = \begin{bmatrix} 1/27 & -19/27 & -4/27 \\ 7/27 & -11/27 & -8/27 \\ 5/27 & 13/27 & 7/27 \end{bmatrix}$

iv. F^{-1} does not exist (not square)

c. $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ -2 & -1 \\ 0 & 5 \end{bmatrix}\begin{bmatrix} 1 & 3 & -2 & 0 \\ 2 & 4 & -1 & 5 \end{bmatrix} = \begin{bmatrix} 1+4 & 3+8 & -2-2 & 0+10 \\ 3+8 & 9+16 & -6-4 & 0+20 \\ -2-2 & -6-4 & 4+1 & 0-5 \\ 0+10 & 0+20 & 0-5 & 0+25 \end{bmatrix} = \begin{bmatrix} 5 & 11 & -4 & 10 \\ 11 & 25 & -10 & 20 \\ -4 & -10 & 5 & -5 \\ 10 & 20 & -5 & 25 \end{bmatrix}$

$\begin{bmatrix} 6 & -7 \\ 11 & -5 \\ 2 & 3 \end{bmatrix}\begin{bmatrix} 6 & 11 & 2 \\ -7 & -5 & 3 \end{bmatrix} = \begin{bmatrix} 36+49 & 24+35 & 12-21 \\ 66+35 & 44+25 & 22-15 \\ 12-21 & 8-15 & 4+9 \end{bmatrix} = \begin{bmatrix} 85 & 59 & -9 \\ 101 & 69 & 7 \\ -9 & -7 & 13 \end{bmatrix}$

F^TF is symmetric. GG^T is not.