



$$1) \begin{matrix} & S & I & R \\ \begin{matrix} S \\ I \\ R \end{matrix} & \begin{bmatrix} .85 & 0 & 0 \\ .15 & .12 & 0 \\ 0 & .84 & 1.0 \end{bmatrix} \end{matrix}$$

2) Yes, common fact, everyone must be accounted for

$$3) \begin{bmatrix} .85 & 0 & 0 \\ .15 & .12 & 0 \\ 0 & .84 & 1.0 \end{bmatrix} \begin{bmatrix} .9 \\ .07 \\ .03 \end{bmatrix}$$

$$= \begin{bmatrix} .77 \\ .14 \\ .09 \end{bmatrix}$$

$$4) \begin{bmatrix} .85 - \lambda & 0 & 0 \\ .15 & .12 - \lambda & 0 \\ 0 & .86 & 1 - \lambda \end{bmatrix}$$

$$\hookrightarrow \lambda_1 = 1, \lambda_2 = .12, \lambda_3 = .85$$

According to the calculator,

$$V_1 = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \quad V_2 = \begin{pmatrix} 0 \\ -1 \\ 1 \end{pmatrix} \quad V_3 = \begin{pmatrix} -.03 \\ -.17 \\ 1 \end{pmatrix}$$

$$5) T^{12}$$

$$\begin{bmatrix} 0 & 0 & -.83 \\ 0 & -1 & -.17 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 1^{12} & 0 & 0 \\ 0 & .12^{12} & 0 \\ 0 & 0 & .85^{12} \end{bmatrix} \begin{bmatrix} 1 & 1 & 1 \\ .20 & -1 & 0 \\ -1.20 & 0 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 0.14 & 0 & 0 \\ .03 & 0 & 0 \\ .83 & 1 & 1 \end{bmatrix} \begin{bmatrix} .9 \\ .07 \\ .03 \end{bmatrix} = \begin{bmatrix} 0.13 \\ 0.03 \\ 0.85 \end{bmatrix}$$

6) Yes, it'll stabilize to

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

7) It is not the right model for COVID19, since there is no "Dead" mode. So we shall change it to add the D node after infected which would change the matrix to a 4 by 4