HS

1. $P=$

	stage 1	stage 2	stage 3 ← current state
stage 1	0.5	0.3	0
stage 2	0.4	0.5	0.5
stage 3	0.1	0.2	0.5

↑
Next state

2.

stage 1   today

$0.5\swarrow$ $2\downarrow^{0.4}$ $\searrow^{0.1}$ 3   tomorrow

$2\downarrow^{0.4}$ $2\downarrow^{0.5}$ $2\downarrow^{0.5}$ the day after tomorrow
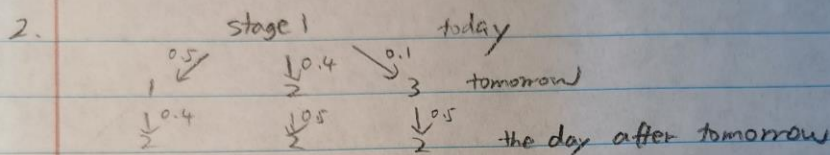
$P_{12}^{(2)} = 0.5 \times 0.4 + 0.4 \times 0.5 + 0.1 \times 0.5$

$= 0.2 + 0.2 + 0.05$

$= 0.45 = 45\%$

3. $A = RAR^{-1}$

$A^n = (RAR^{-1})^n$

$A' = RA^n R^{-1}$

$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0.0697 & 0 \\ 0 & 0 & 0.4304 \end{bmatrix}$

$A^n = \begin{bmatrix} 1^n & 0 & 0 \\ 0 & 0.0697^n & 0 \\ 0 & 0 & 0.4304^n \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ for initial

$A^n = \begin{bmatrix} -0.4699 & -0.5551 & -0.7801 \\ -0.7832 & 0.7961 & 0.1813 \\ -0.4072 & -0.241 & 0.5988 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} -0.4699 & -0.5551 & -0.7801 \\ -0.7832 & 0.7961 & 0.1813 \\ -0.4072 & -0.241 & 0.5988 \end{bmatrix}$

$= \begin{bmatrix} 0.28302 & 0.26302 & 0.28302 \\ 0.47172 & 0.47172 & 0.47172 \\ 0.24526 & 0.24526 & 0.24526 \end{bmatrix}$

Thus $P_1 = 0.28302$

$P_2 = 0.47172$

$P_3 = 0.24526$