Problem Q4.1. *Solution.* The norms of each of the rows of A are $\sqrt{11}$, $\sqrt{14}$, $\sqrt{10}$ respectively. Additionally, we need the entry of QA in position (3,1) to be zero. This leads me to believe that the matrix QA must be $\begin{bmatrix} \sqrt{11} & 0 & 0 \\ 0 & \sqrt{14} & 0 \\ 0 & 0 & \sqrt{10} \end{bmatrix}$. Now we have QA, so we can solve for Q by multiplying QA by the inverse of A:

$$\begin{bmatrix} \sqrt{11} & 0 & 0 \\ 0 & \sqrt{14} & 0 \\ 0 & 0 & \sqrt{10} \end{bmatrix} \begin{bmatrix} \frac{-3}{25} & \frac{-1}{25} & \frac{9}{25} \\ \frac{-1}{25} & \frac{8}{25} & \frac{3}{25} \\ \frac{2}{5} & \frac{-1}{5} & \frac{-1}{5} \end{bmatrix} = \begin{bmatrix} \frac{-3\sqrt{11}}{25} & \frac{-\sqrt{11}}{25} & \frac{9\sqrt{11}}{25} \\ \frac{-\sqrt{14}}{25} & \frac{8\sqrt{14}}{25} & \frac{3\sqrt{14}}{25} \\ \frac{2\sqrt{10}}{5} & \frac{-\sqrt{10}}{5} & \frac{-\sqrt{10}}{5} \end{bmatrix} = Q.$$