1. Suppose that $A$ is a $3 \times 3$ matrix and that $Q_1, Q_2$ and $Q_3$ form a basis for $R^3$. Suppose also that $AQ_1 = -Q_2 + 3Q_3$, $AQ_2 = -2Q_3$, $AQ_3 = 0$.

Find a matrix $M$ such that $A = QMQ^{-1}$ where $Q = [Q_1, Q_2, Q_3]$. Use your result to prove that $A$ is nilpotent.