4.2 Solutions

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2. $(6,3,2) \to \frac{1}{7}(6,3,2)$, $(2,-6,3) \cdot \frac{1}{7}(6,3,2) = 0$, $(2,-6,3) \to \frac{1}{7}(2,-6,3)$

14. $(1,7,1,7) \to \frac{1}{10}(1,7,1,7)$, $(0,7,2,7) \cdot \frac{1}{10}(1,7,1,7) = 10$, $(0,7,2,7) - 10 \times \frac{1}{10}(1,7,1,7) = (-1,0,1,0) \to \frac{1}{\sqrt{2}}(-1,0,1,0)$, $(1,8,1,6) \cdot \frac{1}{10}(1,7,1,7) = 10$, $(1,8,1,6) - 10 \times \frac{1}{10}(1,7,1,7) = (0,1,0,-1) \to \frac{1}{\sqrt{2}}(0,1,0,-1)$

16. $Q = \begin{bmatrix} 6/7 & 2/7 \\ 3/7 & 3/7 \\ 2/7 & 3/7 \end{bmatrix}$, $R = \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$

34. $RREF(A) = \begin{bmatrix} 1 & 0 & -1 & -2 \\ 0 & 1 & 2 & 3 \end{bmatrix}$, so let one vector be $(1,-1,1,0)$ and the other $(2,-3,0,1)$.
$(1,-1,1,0) \to \frac{1}{\sqrt{3}}(1,-1,1,0)$,
$(2,-3,0,1) \cdot \frac{1}{\sqrt{3}}(1,-1,1,0) = \frac{5}{\sqrt{3}}$, $(2,-3,0,1) - \frac{5}{3}(1,-1,1,0) = \frac{1}{3}(1,-4,-5,3) \to \frac{1}{\sqrt{51}}(1,-4,-5,-3)$

40. Q will have n columns, each of which will be the corresponding column of A divided by the magnitude of that column. R will be diagonal, and each diagonal entry will be the magnitude of the corresponding column of A.

42. r_{11} is the length of $\vec{v}_1$ and r_{22} is the length of the line passing through the tip of $\vec{v}_2$ and orthogonal to $\vec{v}_1$, or in other words, $\vec{v}_2 - \text{proj}_L \vec{v}_2$. $r_{11} r_{22}$ is the area of the *parallelogram* whose sides are $\vec{v}_1$ and $\vec{v}_2$.