Chapter 5- Answers to even problems.

Section 5.1

2. $\|\vec{v}\| = \sqrt{29}$
4. $\alpha = \cos^{-1}(\frac{18}{\sqrt{340}})$
6. $\alpha = \cos^{-1}(\frac{-3}{\sqrt{540}})$
8. Right
28. $\frac{1}{4}\begin{bmatrix} 3 \\ 1 \\ -1 \\ 1 \end{bmatrix}$
36. We need to minimize $a^2 + b^2 + c^2$ subject to $0.2a + 0.3b + 0.5c = 76$. The vector orthogonal to the plane $0.2a + 0.3b + 0.5c = 76$ is $\begin{bmatrix} 0.2 \\ 0.3 \\ 0.5 \end{bmatrix}$. Parametric equations of the line through the origin in this direction are $a = 0.2t$ $b = 0.3t$ and $c = 0.5t$. Substituting these into the equation of the plane, we get $t = 200$, so that $a = 40$, $b = 60$ and $c = 100$.

Section 5.2

2. $\vec{w}_1 = \begin{bmatrix} 6/7 \\ 3/7 \\ 2/7 \end{bmatrix}$ and $\vec{w}_2 = \begin{bmatrix} 2/7 \\ -6/7 \\ 3/7 \end{bmatrix}$.
4. $\vec{w}_1 = \begin{bmatrix} 4/5 \\ 0 \\ 3/5 \end{bmatrix}$, $\vec{w}_2 = \begin{bmatrix} 21/35 \\ 0 \\ -28/35 \end{bmatrix}$ and $\vec{w}_3 = \begin{bmatrix} 0 \\ -1 \\ 0 \end{bmatrix}$.
6. $\vec{w}_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, $\vec{w}_2 = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$ and $\vec{w}_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$.

Section 5.3

6. No. If A^T were orthogonal, then $(A^T)^T A^T = I$. Now $(A^T)^T A^T = AA^T$ may not equal to I. We are only guaranteed that A is orthogonal, so $A^T A = I$ and this does not guarantee $AA^T = I$. For example, let $A = \frac{1}{2}\begin{bmatrix} 1 & 1 \\ 1 & 1 \\ 1 & -1 \\ 1 & -1 \end{bmatrix}$.