Section 12.3 Solutions

7. 1

11. The angle between $\vec{u}$ and $\vec{v}$ is 60° so $\vec{u}\cdot\vec{v} = |\vec{u}||\vec{v}|\cos 60° = \frac{1}{2}$

For $\vec{u}\cdot\vec{w}$ move $\vec{w}$ so that it has the same initial point as $\vec{v}$

In that case $\theta = 120°$ so $\vec{u}\cdot\vec{w} = |\vec{u}||\vec{w}|\cos(120°) = -\frac{1}{2}$.

15. $\cong 63°$

17. $\cong 146°$

23. (a) $\vec{a}$ and $\vec{b}$ are orthogonal

(b) $\vec{a}$ and $\vec{b}$ are neither orthogonal nor parallel

(c) $\vec{a}$ and $\vec{b}$ are parallel

(d) $\vec{a}$ and $\vec{b}$ are orthogonal.

27. $\vec{a} = \frac{i}{\sqrt{3}} \quad -\frac{j}{\sqrt{3}} \quad -\frac{k}{\sqrt{3}}$

$\vec{a} = -\frac{1}{\sqrt{2}}i \quad +\frac{j}{\sqrt{3}} \quad +\frac{k}{\sqrt{3}}$

43. $\text{comp}_{\vec{a}}\vec{b} = \frac{-7}{\sqrt{9}} \qquad \text{proj}_{\vec{a}}\vec{b} = \frac{-7}{\sqrt{9}}\frac{\vec{a}}{|\vec{a}|}$

47. $\langle 0, 0, -2\sqrt{10} \rangle$.

64. if $(\vec{u}+\vec{v})$ and $(\vec{u}-\vec{v})$ are orthogonal, then

$(\vec{u}+\vec{v})\cdot(\vec{u}-\vec{v}) = \vec{u}\cdot\vec{u} - \vec{u}\cdot\vec{v} + \vec{v}\cdot\vec{u} - \vec{v}\cdot\vec{v}$

$= |\vec{u}|^2 - |\vec{v}|^2 = 0$ therefore $|\vec{u}|^2 = |\vec{v}|^2 \Rightarrow$

$|\vec{u}| = |\vec{v}|$ so $\vec{u}$ and $\vec{v}$ have the same length.