The Dot Product

Note

- **v** and **w** are parallel if there exists a number, n such that **v** = n**w**
- **v** and **w** are orthogonal if the angle between them is 90º

$$\cos\theta = \frac{u \cdot v}{\|u\| \times \|v\|}$$

1. (a) find the dot product **v** · **w**, (b) find the angle between **v** and **w**, (c) state whether the vectors are parallel, orthogonal, or neither.
(Similar to p.355 #7-16)

$\mathbf{v} = \sqrt{3}\mathbf{i} + 3\mathbf{j}$ and $\mathbf{w} = \mathbf{i} + \mathbf{j}$

2. (a) find the dot product **v** · **w**, (b) find the angle between **v** and **w**, (c) state whether the vectors are parallel, orthogonal, or neither.
(Similar to p.355 #7-16)

$\mathbf{v} = 5\mathbf{i} + \mathbf{j}$ and $\mathbf{w} = -2\mathbf{i} + 4\mathbf{j}$

3. (a) find the dot product **v** · **w**, (b) find the angle between **v** and **w**, (c) state whether the vectors are parallel, orthogonal, or neither.
(Similar to p.355 #7-16)

$\mathbf{v} = \mathbf{i} + \mathbf{j}$ and $\mathbf{w} = \mathbf{i} - \mathbf{j}$

4. (a) find the dot product **v** · **w**, (b) find the angle between **v** and **w**, (c) state whether the vectors are parallel, orthogonal, or neither.
(Similar to p.355 #7-16)

$\mathbf{v} = 2\mathbf{i} + 3\mathbf{j}$ and $\mathbf{w} = 8\mathbf{i} + 12\mathbf{j}$

Note

The decomposition of **v** into $\mathbf{v}_1$ and $\mathbf{v}_2$, where $\mathbf{v}_1$ is parallel to **w** and $\mathbf{v}_2$ is orthogonal to **w** is:

$$v_1 = \frac{v \cdot w}{\|w\|^2} w \qquad v_2 = v - v_1$$

5. Decompose **v** into two vectors $\mathbf{v}_1$ and $\mathbf{v}_2$, where $\mathbf{v}_1$ is parallel to **w** and $\mathbf{v}_2$ is orthogonal to **w**
(Similar to p.355 #19-24)

$\mathbf{v} = -2\mathbf{i} + 5\mathbf{j}$, $\mathbf{w} = 4\mathbf{i} + \mathbf{j}$