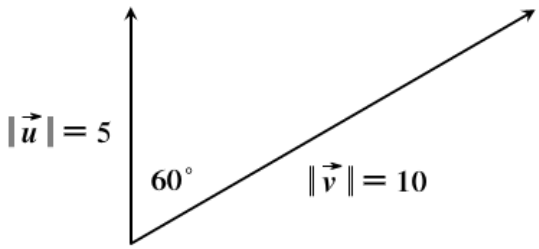
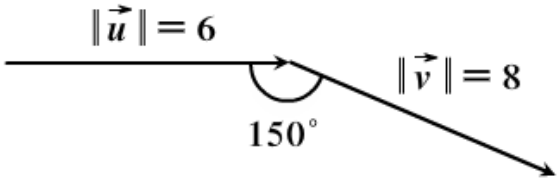
1) Find the cross product of the unit vectors.
   a) $\mathbf{j}\times\mathbf{i}$
   b) $\mathbf{i}\times\mathbf{j}$
   c) $\mathbf{k}\times\mathbf{i}$
   d) $\mathbf{i}\times\mathbf{k}$

2) Find $\|\vec{u}\times\vec{v}\|$ and determine whether $\vec{u}\times\vec{v}$ is directed into the page or out of the page.

a)



b)



3) Given $\vec{u} = \langle 7, 3, 2\rangle$ and $\vec{v} = \langle 1, -1, 5\rangle$ find the following:
   a) $\vec{u}\times\vec{v}$
   b) $\vec{v}\times\vec{u}$
   c) $\vec{v}\times\vec{v}$

4) Given the following vectors find $\vec{w} = \vec{u} \times \vec{v}$ and show that it is orthogonal to both $\vec{u}$ and $\vec{v}$.

a) $\vec{u} = 2\mathbf{i} - 3\mathbf{j} + \mathbf{k}$, $\vec{v} = \mathbf{i} - 2\mathbf{j} + \mathbf{k}$

b) $\vec{u} = \mathbf{i} + e^t\mathbf{j} + e^{-t}\mathbf{k}$, $\vec{v} = 2\mathbf{i} + e^t\mathbf{j} - e^{-t}\mathbf{k}$

c) $\vec{u} = \langle t, t^2, t^3 \rangle$, $\vec{v} = \langle 1, 2t, 3t^2 \rangle$

5) Find two unit vectors orthogonal to both $\langle 1, -1, 1 \rangle$ and $\langle 0, 4, 4 \rangle$.

6) Find the area of the parallelogram that has the given vectors as adjacent sides:

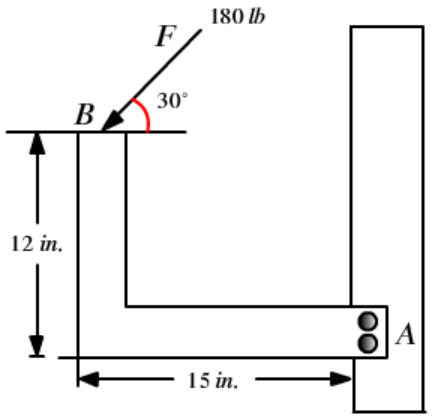
a) $\vec{u} = \mathbf{j}$, $\vec{v} = \mathbf{j} + \mathbf{k}$

b) $\vec{u} = \langle 3, 2, -1 \rangle$, $\vec{v} = \langle 1, 2, 3 \rangle$

7) Show that $(\vec{u}\times\vec{v})\cdot\vec{v}=0$ for all vectors $\vec{u}$ and $\vec{v}$.

8) The vertices of a triangle are: $(2,1,5)$, $(-1,3,4)$, and $(3,0,6)$, find the following:
   a) A vector orthogonal to the plane of the triangle.
   b) The area of the triangle.

9) A force of 180 pounds acts on the bracket shown below, determine the magnitude of the moment about A by evaluating $\left\|\overrightarrow{AB}\times\vec{F}\right\|$.



10) Find the volume of the parallelepiped with the given vertices: $(0,0,0)$, $(3,0,0)$, $(0,5,1)$, $(2,0,5)$, $(3,5,1)$, $(5,0,5)$, $(2,5,6)$, $(5,5,6)$.

11) Use the scalar triple product to determine whether the points: $(1,0,1)$, $(2,4,6)$, $(3,-1,2)$, and $(6,2,8)$ lie in the same plane.

12) A wrench 30 cm long lies along the positive $y-axis$ and grips a bolt at the origin. A force is applied in the direction $\langle 0,3,-4 \rangle$ at the end of the wrench. Find the magnitude of the force needed to supply 100 J of torque to the bolt.