

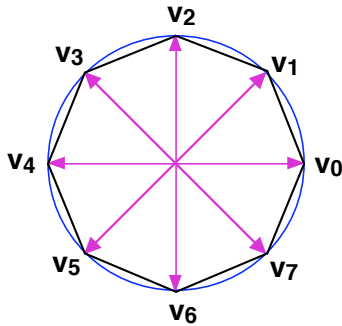
## SUPPLEMENT TO SECTION 10.3

1. In each part, determine whether  $\vec{u}$  and  $\vec{v}$  make an acute angle, an obtuse angle, or are orthogonal.

(a)  $\vec{u} = 7\vec{i} + 3\vec{j} + 5\vec{k}$ ,  $\vec{v} = -8\vec{i} + 4\vec{j} + 2\vec{k}$ .

(b)  $\vec{u} = \langle 4, 1, 6 \rangle$ ,  $\vec{v} = \langle -3, 0, 2 \rangle$

2. Does the triangle in 3-space with vertices  $(-1, 2, 3)$ ,  $(2, -2, 0)$ , and  $(3, 1, -4)$  have an obtuse angle? Justify your answer.
3. The figure below shows eight vectors that are equally spaced around a circle of radius 1. Find the dot product of  $\vec{v}_0$  with each of the other seven vectors.



4. Use vectors to show that  $A(2, -1, 1)$ ,  $B(3, 2, -1)$  and  $C(7, 0, -2)$  are vertices of a right triangle. At which vertex is the right angle?
5. Explain why each of the following expressions makes no sense.

(a)  $\vec{u} \cdot (\vec{v} \cdot \vec{w})$

(b)  $(\vec{u} \cdot \vec{v}) + \vec{w}$

(c)  $\|\vec{u} \cdot \vec{v}\|$

(d)  $k \cdot (\vec{u} + \vec{v})$

6. Let  $\vec{u}$  and  $\vec{v}$  be adjacent sides of a parallelogram. Use vectors to prove that the diagonals of the parallelogram are perpendicular if and only if the sides are equal in length.
7. Let  $\vec{u}$  and  $\vec{v}$  be adjacent sides of a parallelogram. Use vectors to prove that the parallelogram is a rectangle if and only if the diagonals are equal in length.