1. Give the velocity vector for wind blowing at 10 miles/hr toward the south-east. (Assume north is the positive y-direction.)

Solution. Since the wind blows 10 miles/hr south-east, the velocity vector, $\vec{v}$, points in a direction that is 45 degrees below the positive x-axis. Thus in components,

$$\begin{aligned}\vec{v} &= 10\cos(-45^\circ)\hat{\mathbf{i}} + 10\sin(-45^\circ)\hat{\mathbf{j}} \\ &= 10\cos(45^\circ)\hat{\mathbf{i}} - 10\sin(45^\circ)\hat{\mathbf{j}} \\ &= \frac{10}{\sqrt{2}}\hat{\mathbf{i}} - \frac{10}{\sqrt{2}}\hat{\mathbf{j}}.\end{aligned}$$

□