4.19. **Model:** Let Susan's frame be S and Shawn's frame be S′. S′ moves relative to S with velocity V. Both Susan and Shawn are observing the intersection point from their frames.

Solve: The Galilean transformation of velocity is $\vec{v} = \vec{v}' + \vec{V}$, where $\vec{v}$ is the velocity of the intersection point from Susan's reference frame, $\vec{v}'$ is the velocity of the intersection point from Shawn's frame S′, and $\vec{V}$ is the velocity of S′ relative to S or Shawn's velocity relative to Susan. Because $\vec{v} = -(60 \text{ mph})\hat{j}$ and $\vec{v}' = -(45 \text{ mph})\hat{i}$, we have $\vec{V} = \vec{v} - \vec{v}' = (45 \text{ mph})\hat{i} - (60 \text{ mph})\hat{j}$. This means that Shawn's speed relative to Susan is

$$V = \sqrt{(45 \text{ mph})^2 + (-60 \text{ mph})^2} = 75 \text{ mph}$$