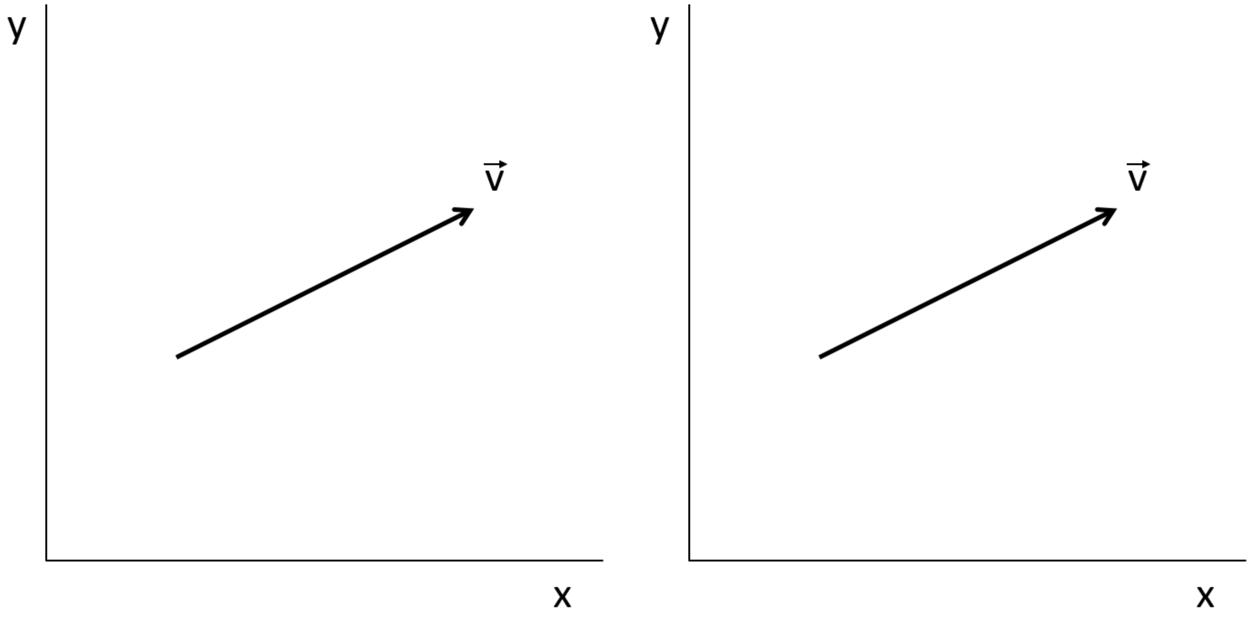
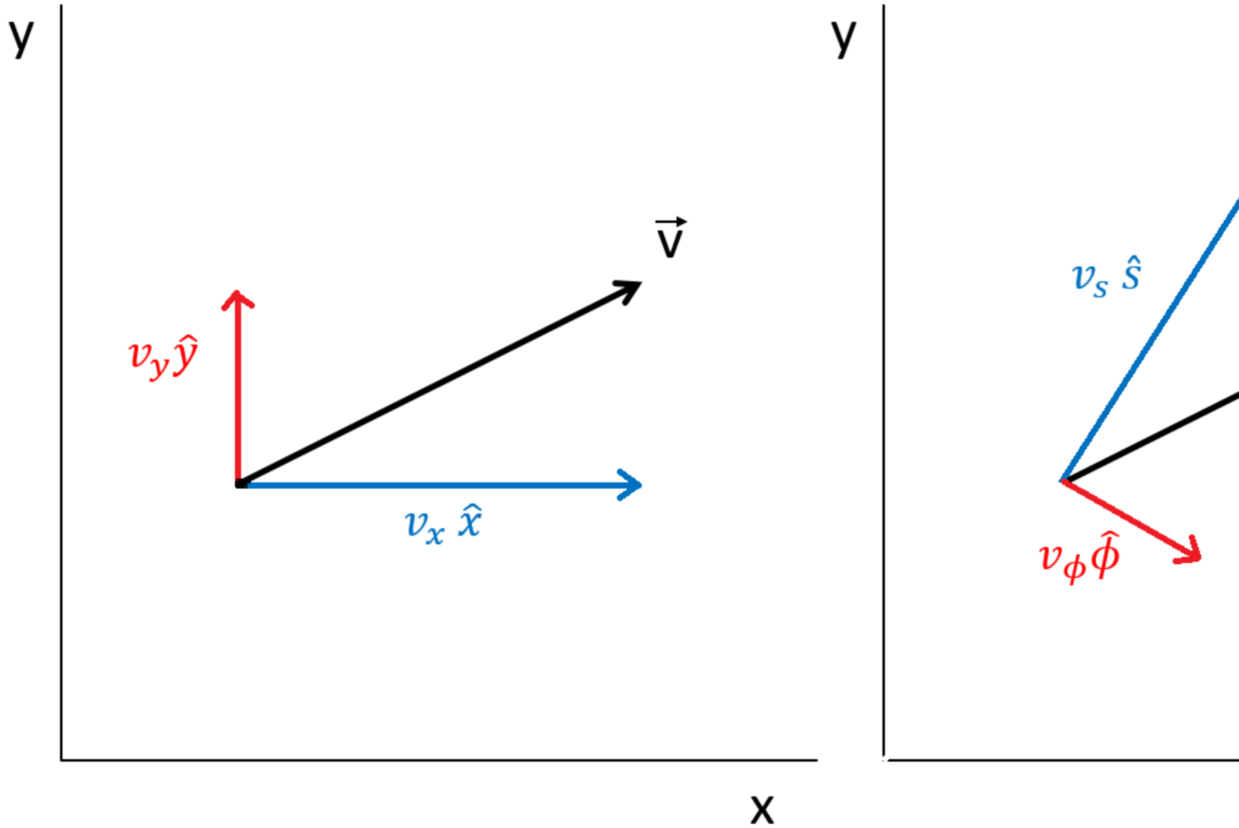


1. In the first figure, draw the projections of $\vec{v}$ onto the rectangular basis vectors $\hat{x}$ and $\hat{y}$.
2. In the second figure, draw the projections of $\vec{v}$ onto the polar basis vectors $\hat{s}$ and $\hat{\phi}$.



Solution

3. Write the components of $\vec{v}$ as dot products:

$$v_x = \qquad\qquad v_s =$$

$$v_y = \qquad\qquad v_\phi =$$

Solution

$$v_x = \hat{x} \cdot \vec{v} \qquad\qquad v_s = \hat{s} \cdot \vec{v}$$

$$v_y = \hat{y} \cdot \vec{v} \qquad\qquad v_\phi = \hat{\phi} \cdot \vec{v}$$

4. Write the components of $\vec{v}$ as bra/kets: (Warning: Often, particularly in quantum mechanics settings, we will assume that all kets are states and therefore normalized so that their probability is one. We are NOT making that assumption here. Write the vector $\vec{v} = |v\rangle$ without worrying about its normalization.)

$$v_x = \qquad\qquad v_s =$$

$$v_y = \qquad\qquad v_\phi =$$

Solution

$$v_x = \langle x|v\rangle \qquad\qquad v_s = \langle s|v\rangle$$

$$v_y = \langle y|v\rangle \qquad\qquad v_\phi = \langle \phi|v\rangle$$