1. Find all vectors $\vec{A}$ in 2 dimensions having $|\vec{A}| = 5$ with the component of $\vec{A}$ in the direction of $\hat{\mathbf{i}}$ equal to $3\hat{\mathbf{i}}$.

Solution. Since the component of $\vec{A}$ in the $\hat{\mathbf{i}}$-direction is 3, we have $\vec{A} = 3\hat{\mathbf{i}} + b\hat{\mathbf{j}}$ for some b. Since $|\vec{A}| = 5$, we have $\sqrt{3^2 + b^2} = 5$, so $b = 4$ or $b = -4$. Thus there are two vectors satisfying the given properties: either $\vec{A} = 3\hat{\mathbf{i}} + 4\hat{\mathbf{j}}$ or $\vec{A} = 3\hat{\mathbf{i}} - 4\hat{\mathbf{j}}$. $\qquad\square$