An owl is flying in a straight line with velocity vector $6\mathbf{i} + 3\mathbf{j} + 3\mathbf{k}$ (km/hr). Suppose the owl is currently at $(0, 0, 0)$, where will it be after 20 minutes?

A. $(6, 12, 3)$
B. $(120, 60, 60)$
C. $(2, 1, 1)$
D. $(-120, -60, -60)$
E. $(-2, -1, -1)$
Find the velocity vector $\mathbf{v}_w$ of a wind blowing \textit{east to west} with a speed of 5 km/hr

A. $\mathbf{v}_w = (5, 0)$
B. $\mathbf{v}_w = (-5, 0)$
C. $\mathbf{v}_w = (0, 5)$
D. $\mathbf{v}_w = (5, -5)$
E. $\mathbf{v}_w = \left( \frac{5}{\sqrt{2}}, \frac{5}{\sqrt{2}} \right)$
Find a vector $\mathbf{v}$ with $\|\mathbf{v}\| = 10$ and points in the opposite direction as $\mathbf{w} = 3\mathbf{i} + 4\mathbf{j}$.

A. $\mathbf{v} = (6, 8)$
B. $\mathbf{v} = (-6, -8)$
C. $\mathbf{v} = (10, 0)$
D. $\mathbf{v} = (30, 40)$
E. $\mathbf{v} = (-5\sqrt{2}, -5\sqrt{2})$
Question 4

Recall that the triangle inequality is given by

\[ \|a + b\| \leq \|a\| + \|b\| \]

for \( a, b \in \mathbb{R}^3 \). When will equality occur (i.e. \( \|a + b\| = \|a\| + \|b\| \))?

A. When \( a = 0 \)
B. When \( a \) is a scalar multiple of \( b \)
C. When \( a \) is orthogonal to \( b \)
D. (A) and (B)
E. (A), (B), and (C)
Recall that the Cauchy-Schwarz inequality is given by

$$|\mathbf{a} \cdot \mathbf{b}| \leq \|\mathbf{a}\| \|\mathbf{b}\|$$

for $\mathbf{a}, \mathbf{b} \in \mathbb{R}^3$. When will equality occur (i.e. $|\mathbf{a} \cdot \mathbf{b}| = \|\mathbf{a}\| \|\mathbf{b}\|$)?

A. When $\mathbf{a} = \mathbf{0}$
B. When $\mathbf{a}$ is a scalar multiple of $\mathbf{b}$
C. When $\mathbf{a}$ is orthogonal to $\mathbf{b}$
D. (A) and (B)
E. (A), (B), and (C)