

Chapter 2 Problem 46 [†]

Solution

Find the displacement vector of the fly in the room.

The position of the fly at point b in unit vector notation is

$$\vec{b} = \{4.0 \hat{i} + 1.5 \hat{j} + 2.5 \hat{k}\} m$$

The position of the fly at point e in unit vector notation is

$$\vec{e} = \{1.0 \hat{i} + 4.5 \hat{j} + 0.5 \hat{k}\} m$$

The displacement of the fly in the room between points b and e is

$$\vec{displace} = \vec{e} - \vec{b} = \{1.0 \hat{i} + 4.5 \hat{j} + 0.5 \hat{k}\} - \{4.0 \hat{i} + 1.5 \hat{j} + 2.5 \hat{k}\}$$

$$\vec{displace} = \{(1.0 - 4.0) \hat{i} + (4.5 - 1.5) \hat{j} + (0.5 - 2.5) \hat{k}\} = \{-3.0 \hat{i} + 3.0 \hat{j} - 2.0 \hat{k}\}$$

The magnitude of this vector is.

$$displace = \sqrt{(-3.0)^2 + (3.0)^2 + (-2.0)^2} = 4.69 m$$

Assume the numbers are good to 2 significant figures, the magnitude of the displacement is 4.7 m.

[†]Problem from University Physics by Ling, Sanny and Moebs (OpenStax)