

Physics 101- Chapter 7

Quiz No. 4

Name: Key

ID:

Sec: 30

A constant force of magnitude 10 N makes an angle of 150° (measured counterclockwise) with the positive x direction as it acts on a 2 Kg object moving in the xy plane. How much work is done on the object by the force as the object moves from the origin to the point with position vector $(2\hat{i} - 4\hat{j})$ m?

The force vector is:

$$\vec{F} = F_x \hat{i} + F_y \hat{j} = -F \cos 30^\circ \hat{i} + F \sin 30^\circ \hat{j}$$

$$\vec{F} = -8.7\hat{i} + 5\hat{j}$$

The displacement vector is:

$$\Delta \vec{r} = \vec{r}_2 - \vec{r}_1 = (2\hat{i} - 4\hat{j}) - (0\hat{i} + 0\hat{j}) = 2\hat{i} - 4\hat{j}$$

The work:

$$W = \vec{F} \cdot \Delta \vec{r} = (-8.7\hat{i} + 5\hat{j}) \cdot (2\hat{i} - 4\hat{j}) = (-8.7 \times 2) + (5 \times -4)$$

$$W = -17.4 - 20 = -37.4 \text{ J}$$

