Answer on Question #47517-Physics-Quantum Mechanics
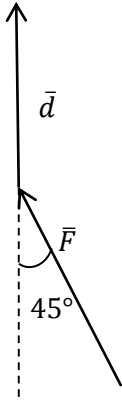
A sailboat moves north for a distance of $d = 10.00 \, km$ when blown by a wind from the exact southeast with a force of $F = 2.00 \cdot 10^4 \, N$. The sailboat travels the distance in $t = 1.0 \, h$. How much work was done by the wind? What was the wind's power? Your response should include all of your work and a free-body diagram.

Solution

The work was done by the wind is

$$W = \bar{F} \cdot \bar{d} = Fd \cos 45°,$$

where $45°$ is angle between the directions of a force and a distance.

$$W = 2.00 \cdot 10^4 \, N \cdot 10.00 \cdot 10^3 \, m \cdot \cos 45° = 1.41 \cdot 10^8 J.$$

The wind's power is

$$P = \frac{W}{t} = \frac{1.41 \cdot 10^8 J}{1.0 \cdot 3600 s} = 39.2 \, kwatt.$$