

Student name: _____

5-minute Quiz #7

Answer these two questions:

1. A woman of mass 50 kg runs up a flight of stairs with inclination of 30° and height of 20 m. How much power the woman uses if she reaches the top of the stairs in 10 s? *[5 points]*

2. Consider a particle on which a constant force $\vec{F} = (3N)\hat{i} + (4N)\hat{j}$. As a result, the particle moves along a straight path from a Cartesian coordinate of (0 m, 0 m) to (5 m, 6 m). What is the work done by \vec{F} ? *[5 points]*

Key Equations

Work done by a force over an infinitesimal displacement	$dW = \vec{\mathbf{F}} \cdot d\vec{\mathbf{r}} = \left \vec{\mathbf{F}} \right \left d\vec{\mathbf{r}} \right \cos \theta$
Work done by a force acting along a path from A to B	$W_{AB} = \int_{\text{path } AB} \vec{\mathbf{F}} \cdot d\vec{\mathbf{r}}$
Work done by a constant force of kinetic friction	$W_{\text{fr}} = -f_k l_{AB} $
Work done going from A to B by Earth's gravity, near its surface	$W_{\text{grav},AB} = -mg(y_B - y_A)$
Work done going from A to B by one-dimensional spring force	$W_{\text{spring},AB} = -\left(\frac{1}{2}k\right)(x_B^2 - x_A^2)$
Kinetic energy of a non-relativistic particle	$K = \frac{1}{2}mv^2 = \frac{p^2}{2m}$
Work-energy theorem	$W_{\text{net}} = K_B - K_A$
Power as rate of doing work	$P = \frac{dW}{dt}$
Power as the dot product of force and velocity	$P = \vec{\mathbf{F}} \cdot \vec{\mathbf{v}}$