

Physics 101-Rec
Quiz # 5

Instructor: Dr. Mekki

Name: Key Id#: _____ Sect.#: _____

As a 2.0 kg object moves along the x axis, the only force acting on it is given by $F_x = -5x$ where x is in meters.

- (a) What is the work done by this force as the object moves from $x = 2.0$ m to $x = 5.0$ m?

$$\begin{aligned}
 W &= \int_{x=2}^{x=5} F_x dx = \int_2^5 -5x dx = -5 \int_2^5 x dx \\
 &= -5 \left. \frac{x^2}{2} \right|_2^5 = -\frac{5}{2} \left((5)^2 - (2)^2 \right) \\
 &= -52.5 \text{ J}
 \end{aligned}$$

- (b) If the kinetic energy of the object at $x = 2.0$ m is 200 J, what is the speed of the object at $x = 5.0$ m?

$$W = \Delta K = K_f - K_i$$

$$\begin{aligned}
 K_f &= W + K_i = -52.2 + 200 \\
 &= 147.5 \text{ J} = \frac{1}{2} m v_f^2
 \end{aligned}$$

$$\Rightarrow v_f^2 = 147.5 \Rightarrow \boxed{v_f = 12.1 \text{ m/s}}$$