QUIZ#6- CHAPTER7
DATE: 22/10/18

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A particle of mass 2.0 kg moves from $x_i = 0$ to $x_f = 5.0$ m while being acted upon by a single force $F = 3x^2$ directed along the x-axis.

(a) Calculate the change in the kinetic energy of the particle during this motion

$$\Delta K = W = \int_{x_i}^{x_f} F\,dx = 3\int_0^5 x^2\,dx$$

$$= 3\,\frac{x^3}{3}\Big|_0^5 = \boxed{125\ \text{J}}$$

(b) What is the speed of the particle at x = 5.0 m if it started from rest at x = 0?

$$\frac{1}{2}mv_f^2 - \frac{1}{2}m\cancel{v_i^2}^{\,0} = W$$

$$v_f = \sqrt{\frac{2W}{m}} = \sqrt{\frac{2\times 125}{2}} = \boxed{11.2\ \text{m/s}}$$

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A certain force **F** is acting on a body of mass m = 3.0 kg and changes its velocity from an initial value $\mathbf{v}_0$ = (6i – 2j) m/s to a final value $\mathbf{v}_f$ = (8i + 4j) m/s in a time interval of 20 s.

(a) Calculate the work done by the force F.

$$W = \Delta K = \frac{1}{2} m\left(v_f^2 - v_i^2\right)$$

$v_i^2 = 40\ m^2/s^2$

$v_f = 80\ m^2/s^2$

$$= \frac{1}{2} \times 3\ (80 - 40)$$

$$= \boxed{60\ J}$$

(b) How much power is delivered by the force during this time interval?

$$P = \frac{W}{\Delta t} = \frac{60}{20} = \boxed{3\ \text{Watts}}$$

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A 4.0 kg cart starts up an incline with a speed of 5.5 m/s and comes to rest 2.0 m up the 30^0 incline.

(a) Calculate the work done by the normal force.

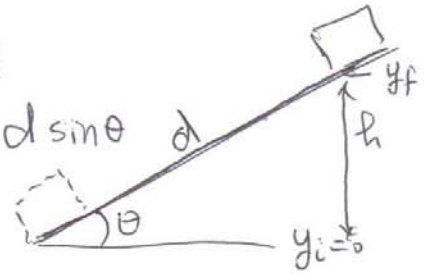
$W_{F_N} = 0$ because F_N is always $\perp$ to the displacement.

(b) Calculate the work done by the gravitational force.

$W_g = -mg(y_f - y_i)$

$= -mgh = -mgd\sin\theta$

$W_g = -39.2\,J$



(c) Calculate the work done by the frictional force using the work energy theorem.

$\Delta K = \Delta W_g + W_f$

$W_f = \Delta K - W_g$

$= \left(0 - \frac{1}{2}mv_i^2\right) - W_g$

$= -60.5 + 39.2 = \boxed{-21.3\,J}$