3. Oompa-Loompas are pulling a 2 kg crate of golden eggs along a rough, but level, surface. In one case it is determined that the position of the block as a function of time is given by : $x(t) = .3t^3 - .1t^2 + .2t$.

a. Find the speed of the block at t = 2 sec.
b. Find an expression for acceleration as a function of time.
c. Find an expression for force as a function of time. ($\bar{a} = \frac{\bar{F}}{m}$)
d. Find the initial kinetic energy of the block ($KE = \frac{1}{2}mv^2$)
e. Find the change in kinetic energy of the block from t = 0 to t = 2 sec.
f. Another lab group determines that the Oompa-Loompa force as a function of distance is given by:

$F(x) = x^3 + 2x + 2$ ~~and the block is pulled at an angle of 15° to the horizontal.~~

Find the change in kinetic energy from x = 0 to x = 2 meters.

g. For the above group find a differential equation for power (Power = the time rate of change of kinetic energy).

a. $.9(2)^2 - .2(2) + .2$

$.9(4) - .4 + .2$

$3.6 - .6$

3 m/s

b. $1.8t - .2$

c. $1.8t - .2 = \frac{F}{2}$

$F = 2(1.8t - .2)$

d. 0

e. $\frac{1}{2}(2)(3)^2$

3^2

9 J

f. $K_{i,f} = \frac{1}{2}(2)(2)^2$

$K_{i,f} = 4$ J

$v = 2(2) + 2$

$v = 4 + 2$

$v = 6$

$K_{f,final} = \frac{1}{2}(2)(6)^2$

$K_{f,final} = 36$ J

$\Delta J = 36$ J

g. 0 watts