"Work" Sheet

1. $W = F \cdot d \cos\theta$ (same direction)

$W = (80N)(10m)(\cos 0°)$

$\boxed{W = 800\,J}$

2. $W = F \cdot d \cos\theta$

$W = F_g \cdot d \cos\theta$

$W = (49N)(12m)(1)$

$\boxed{W = 588\,J}$

or

$W = \Delta E$

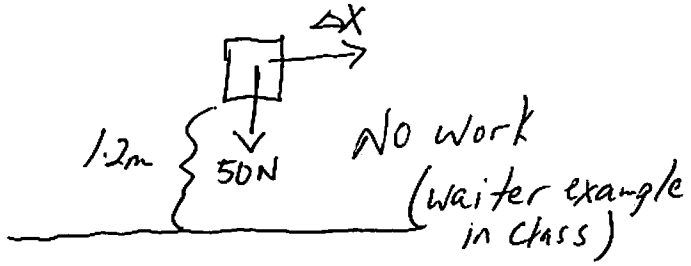
$W = PE_f - PE_i$ ($PE_i = 0$)

$W = mgh$

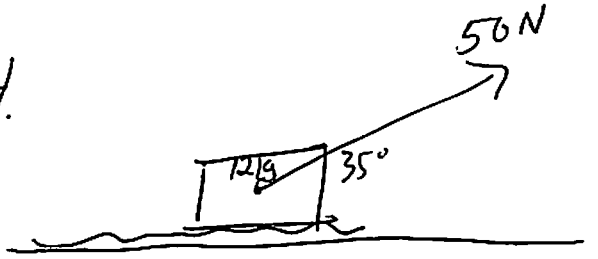
$W = (5kg)(12m)(9.8 m/s^2)$

$\boxed{W = 588\,J}$

3. $\boxed{0\,J \text{ of work}}$ there is no force acting in the same direction as displacement



4.



$W = F \cdot d \cos\theta$

$W = (50\,N)(5m)\cos 35$

$\boxed{W = 614\,J}$

5. $P = 400\,W$

$P = \frac{W}{t}$ $\qquad 5\,m/s \times \frac{60\,s}{1\,m/s} = 300\,s$

$400\,w = \frac{W}{300\,s}$

$\boxed{W = 120{,}000\,J}$

6. a) $KE_i = \frac{1}{2}mv_i^2$ $\qquad \boxed{KE_f = 0\,J}$ (comes to rest)

$KE_i = \frac{1}{2}(50\,kg)(5\,m/s)^2$

$KE_i = (25\,kg)(25\,m^2/s^2)$

$\boxed{KE_i = 625\,J}$

b) W_f must be $\boxed{-625\,J}$

c) $W_f = F \cdot d \cos 180$

$W_f = F \cdot 15m\,(-1)$

$-625 = F \cdot 15$

$\boxed{F_f = 41.7\,N \text{ in the opposite direction}}$

d) $F_f = 41.7$ $\quad F_N = F_g$ b/c flat surface

$F_f = \mu F_N$ $\quad F_N = (50kg)(9.8 m/s^2)$

$F_N = 490N$

$41.7N = \mu(490N)$

$\boxed{\mu = .085}$

7. $PE_g = mgh$

$PE_g = (200kg)(9.8 m/s^2)(10m)$

$\boxed{PE_g = 19{,}600J}$

8. a) $KE = \frac{1}{2}mv_i^2 = \frac{1}{2}(20kg)(15 m/s)^2 = \boxed{2{,}250J}$

b) double speed means $\times 4$ KE $= \boxed{9000J}$

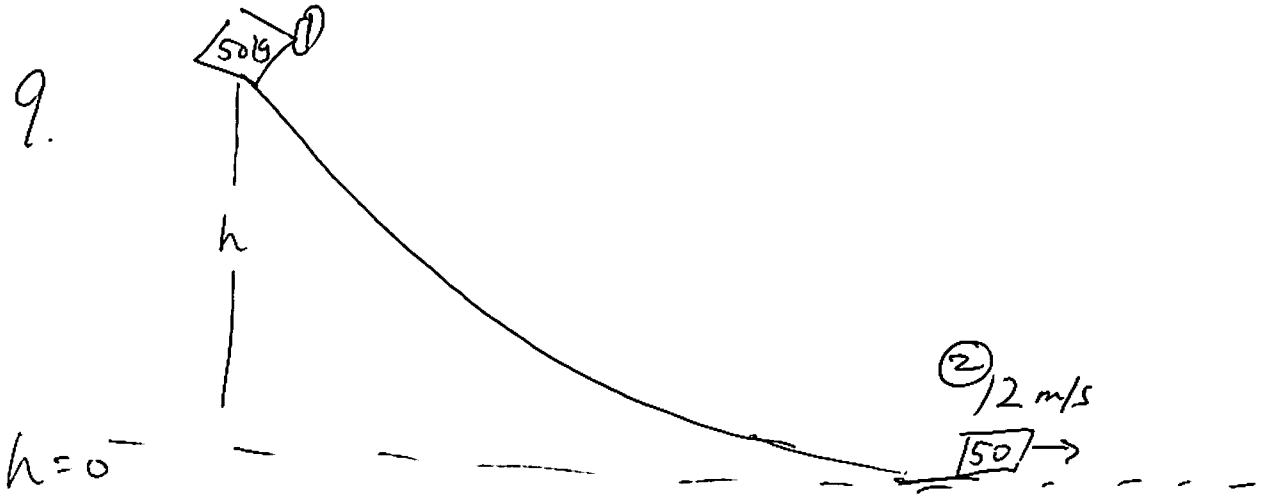
$\frac{1}{2}mv^2$

c) factor of 4

d) $W = \Delta E = \Delta KE = \frac{1}{2}(20kg)(15 m/s)^2 - 0J = \boxed{2{,}250J}$

e) $W = \Delta E = \Delta KE = \frac{1}{2}(20kg)(30 m/s)^2 - \frac{1}{2}(20kg)(15 m/s)^2 = \boxed{6{,}750J}$

9.



$$E_1 = E_2$$

$$PE_1 + KE_1 = PE_2 + KE_2$$

$$mgh_1 = \frac{1}{2}mv_2^2$$

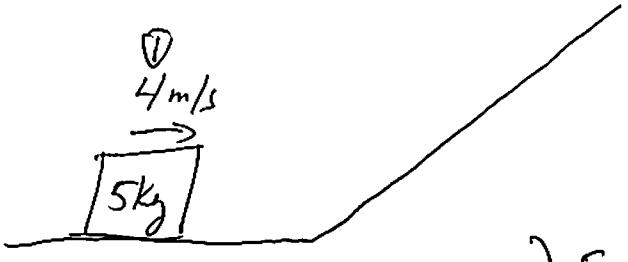
$$9.8\,m/s^2(h) = \frac{1}{2}(v_2^2)$$

$$19.6\,m/s^2(h) = (12\,m/s)^2$$

$$\frac{19.6h}{19.6} = \frac{144\,m^2/s^2}{19.6}$$

$$\boxed{h = 7.3\,m}$$

10.



a) $KE = \frac{1}{2}mv_i^2$

$KE = \frac{1}{2}(5)(4\,m/s)^2$

$\boxed{KE = 40J}$

b) $E_T = KE_1$

$\boxed{= 40J}$

c) No, gravity is a conservative force, and no friction/air

d) $E_1 = E_2$

$40J = mgh$

$40J = (5kg)(9.8m/s^2)(h)$

$40J = 49\frac{kgm}{s^2}h$

$h = .82m$

e) $E_1 = E_3$

$40J = PE_3 + KE_3$

$40J = (5kg)(9.8m/s^2)(.5m) + \frac{1}{2}(5kg)V_3^2$

$40J = 24.5J + 2.5V_3^2$

$15.5J = 2.5V_3^2$

$6.2\frac{m^2}{s^2} = V_3^2$

$V_3 = 2.49m/s$

11) $K = 100\ N/m$

$X = .2m$

a) $F_s = K\Delta x$

$F_s = (100N/m)(.3m - .2m)$

$F_s = 10N$

$PE_s = \frac{1}{2}K(\Delta x)^2$

$PE_s = \frac{1}{2}(100N/m)(.1m)^2$

$PE_s = .5J$

b) $F_s = K\Delta x$

$F_s = (100N/m)(.1m - .2m)$

$F_s = -10N$

$PE_s = \frac{1}{2}K(\Delta x)^2$

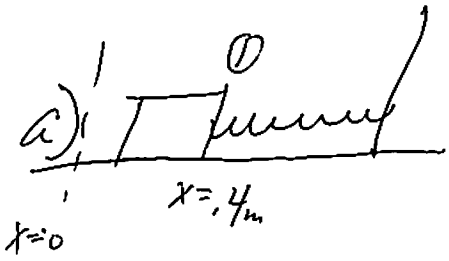
$PE_s = \frac{1}{2}(100N/m)(-.1)^2$

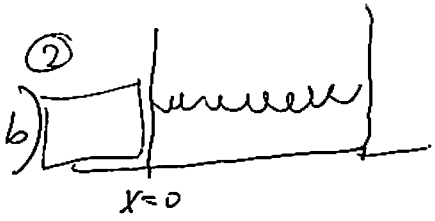
$PE_s = .5J$

12) a) $PE_s = \frac{1}{2}K(\Delta x)^2$

$PE_s = \frac{1}{2}(750 N/m)(.4m)^2$

$\boxed{PE_s = 60J}$





b) $PE_{s1} = KE_2$

$60J = \frac{1}{2}mv_2^2$

$60J = \frac{1}{2}(40kg)(v_2)^2$

$60J = 20kg\ v_2^2$

$\sqrt{3\frac{J}{kg}} = \sqrt{v_2^2}$

$\boxed{v_2 = 1.73 m/s}$