Momentum

$\sum \vec{p} = \sum \vec{p}'$

$\vec{p} = m\vec{v}$

$\vec{J} = \sum \vec{F}\,\Delta t = \Delta \vec{p}$

$\sum \vec{F} = \frac{\Delta \vec{p}}{\Delta t}$

Work and Energy

$W = F_{\parallel} d$

$W_f = fd$

$PE_g = mgh$

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

$P = \frac{\Delta E}{t} = \frac{W}{t}$

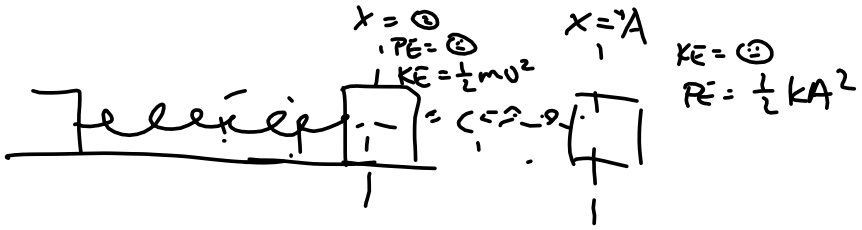
$eff = \frac{E_{out}}{E_{in}}$

Spring

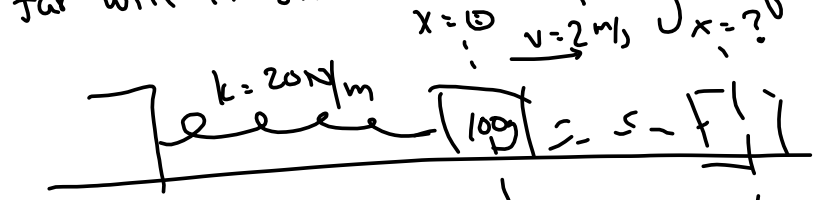
$\vec{F} = -k\vec{x}$

force applied by spring

$PE_s = \frac{1}{2}kx^2$



A 100g mass on the end of an unstretched spring ($k = 20 N/m$) is travelling at $2 m/s$. How far will it stretch the spring before stopping?



$K = \frac{F}{x}$

PE = ☺

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

$= \frac{1}{2}(0.1)(2)^2$

$= 0.2 J$

KE = ☺

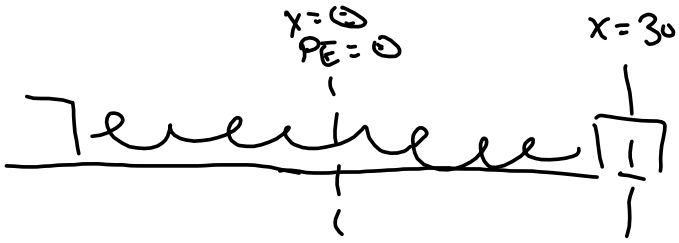
$PE = 0.2 J = \frac{1}{2}kx^2$

$0.2 = \frac{1}{2}(20)x^2$

$0.02 = x^2$

$x = 0.14 m$

19.



50N for 10cm

$k = \frac{F}{x} = \frac{50N}{0.10m}$

$= 500 N/m$

a) $F = kx$

$= (500N)(0.30m)$

$= 150N$

(b) $F_{ave} = ?$

(c) $W = \Delta PE = PE_f$

$= \frac{1}{2}kx^2$

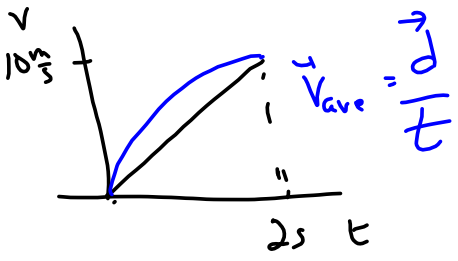
$= \frac{1}{2}(500)(0.30)^2$

$= 22.5J$

$W = F_{ave} d$

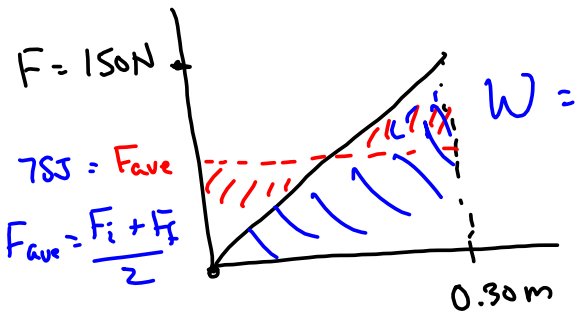
$22.5J = F_{ave}(0.30m)$

$F_{ave} = 75N$



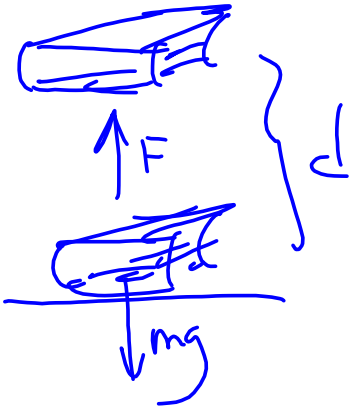
$\vec{v}_{ave} = \frac{\vec{d}}{t}$

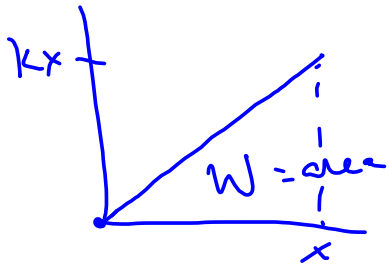
$\frac{v_i + v_f}{2}$



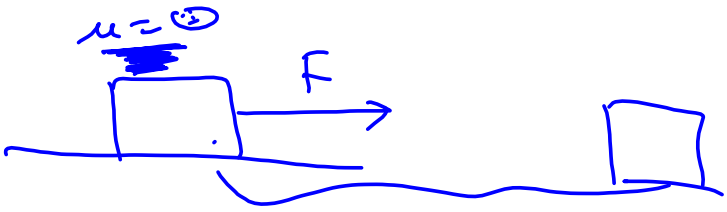
W = Area

$F_{ave} = \frac{W}{d}$

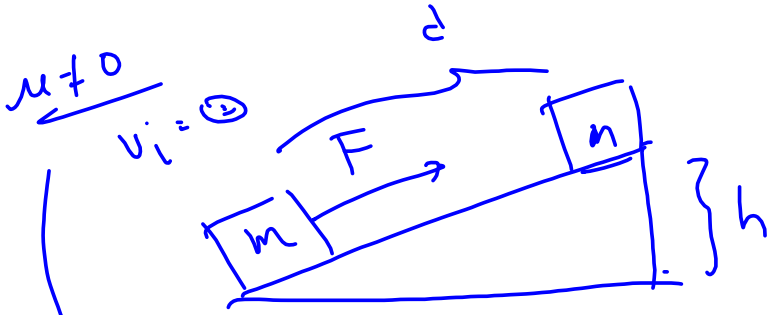




$\text{Area} = \frac{1}{2}kx^2 = PE$



$W = Fd = \Delta KE$



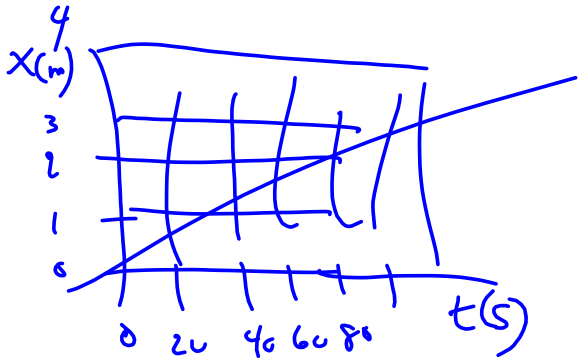
$W = Fd = \underline{KE} + \underline{PE}$

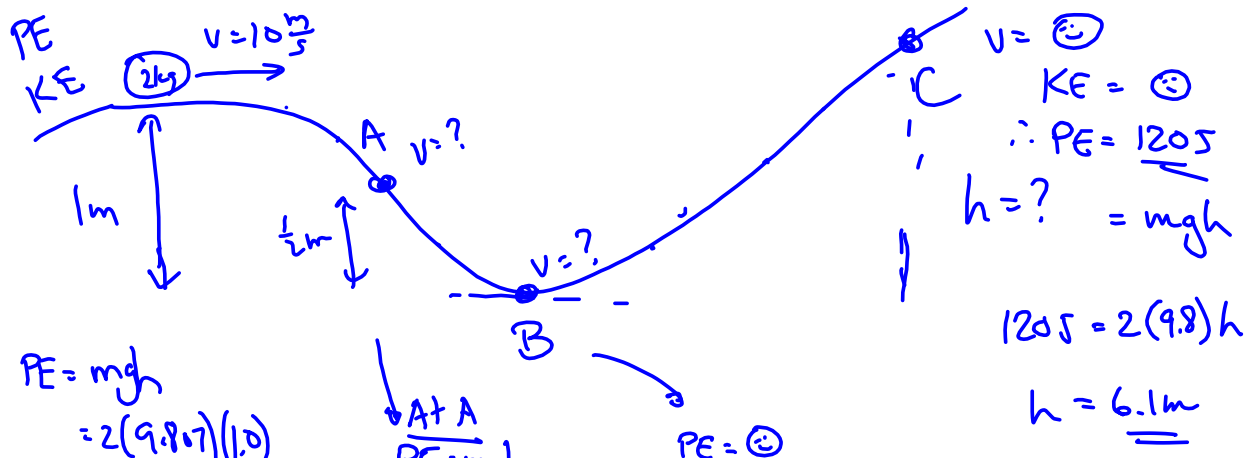
$W = W_f + KE + PE$

A car moves in a straight line and the following data is taken

t(s)	x(m)
☺	☺
1	18
2	39
3	57
4	79

Plot a graph whose slope gives you $\vec{v}$





$PE = mgh$
$= 2(9.8)(1.0)$
$= 19.6\,J$

$KE = \frac{1}{2}mv^2$
$= \frac{1}{2}(2)(10)^2$
$= 100\,J$

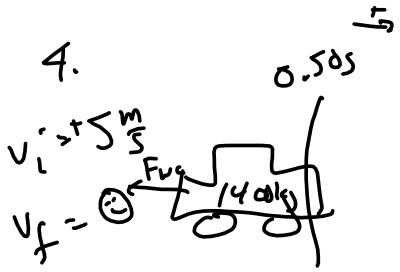
$E_T = 120\,J$

At A
$PE = mgh$
$= 10\,J$
So $KE = 120 - 10\,J$
$= 110\,J = \frac{1}{2}mv^2$
$110\,J = \frac{1}{2}(2)v^2$
$v = 10.5\ m/s$

PE = ☺
So KE = 120J
$= \frac{1}{2}mv^2$
$v^2 = 120\,J$
$v = 11.0\ m/s$

$120\,J = 2(9.8)h$
$h = 6.1\,m$

4.



F_{wc}

F_{cw}

$\vec{J}_{cw}$

$\vec{J} = \boxed{\Sigma \vec{F}\,\Delta t} = \Delta \vec{p} = m\,\Delta \vec{v}$

$\vec{F}_{wc}(0.50s) = 1400kg\left(0 - 5\frac{m}{s}\right)$

$\vec{F}_{wc} = \frac{-7000\ kg\cdot\frac{m}{s}}{0.50s}$

$= -14000N$

$\vec{J} = \vec{F}_{cw}\,\Delta t$

$= (+14000N)(0.50s)$

$= +7000\ Ns$

$\vec{F}_{cw} = +14000N$