PH/M

Mechanical Power and Vertical Springs

$P = W/t$

Look for a change in mechanical energy

$W = Fd$

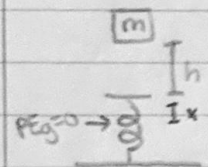
a. $W = \Delta KE = \frac{1}{2}mv_f^2 = \frac{1}{2}(2\times10^3)(20)^2 = 400000\ J$

$P_{avg} = Fv_{avg}$ assume a is constant

$500(10) = 5000\ W$

$400000/15 + 5000 = 31667\ W = 42.4\ hp$

b. $2P_{avg} = 64000\ W$



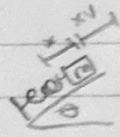
Find the maximum compression of the spring

$E_i = E_f$

$mgh_i = mgh_f + \frac{1}{2}kx^2$

$mg(h+x) = \frac{1}{2}kx^2$

$\frac{1}{2}kx^2 - mgx - mgh = 0$



$PE_g = mgx_v$

Work done by nonconservative forces

$E_i = E_f + W_{nc}$

$W_{nc} = f_k d$