Power :-

$$P_{avg} = \frac{\Delta W}{\Delta t} = \frac{\text{work done}}{\text{time taken}}$$

$$P_{avg} = \frac{\Delta K}{\Delta t} = \frac{\text{change in KE}}{\text{total time}}$$

$$\boxed{P_{inst} = \frac{dW}{dt}} \qquad P_{inst} = \frac{dK}{dt}$$

$$P_{inst} = \frac{\vec{F}\cdot d\vec{x}}{dt}$$

$\vec{v}$

$$\boxed{P_{inst} = \vec{F}\cdot\vec{v}}$$

$$P = |\vec{F}|\,|\vec{v}|\cos\theta$$

+ve / −ve / 0

$\Rightarrow$ Scaler quantity.

$\Rightarrow$ SI unit $\Rightarrow \frac{J}{sec} \Rightarrow$ Watt (W)

$$f_{avg} = \frac{\int f\,dt}{\int dt}$$

$$P = \frac{dw}{dt}$$

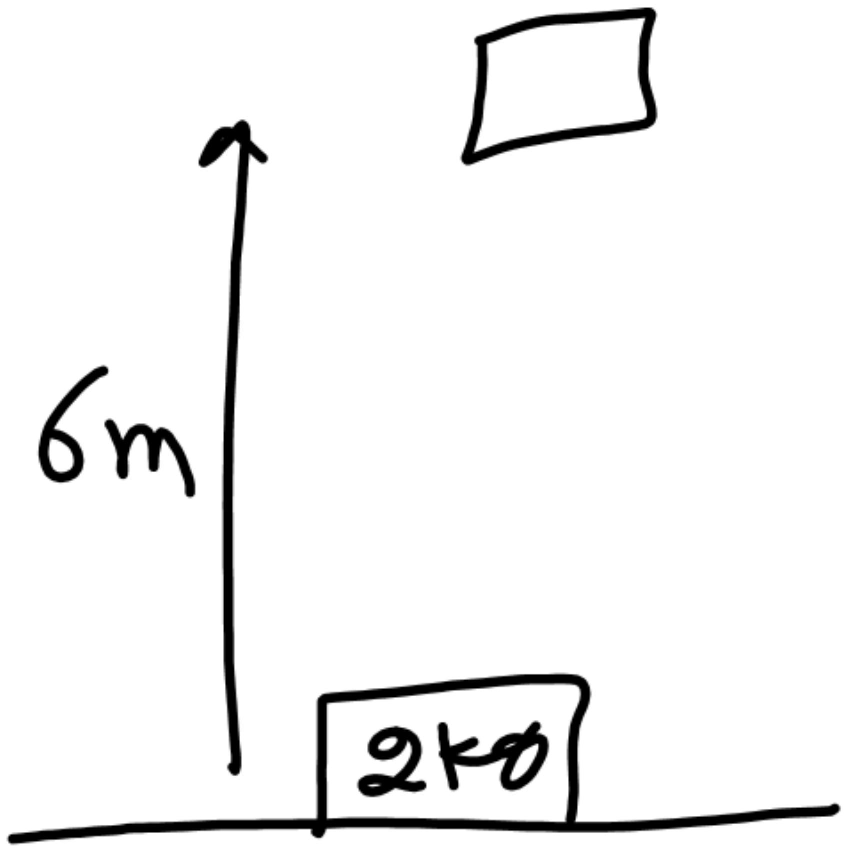
$$\int P\,dt = \int dw$$

$$\int P\,dt = \Delta W$$

$$\boxed{1\,hP = 746\,W}$$

150 B.H.P

$$P_{avg} = \frac{\int P\,dt}{\int dt} = \frac{\Delta W}{\Delta t}$$



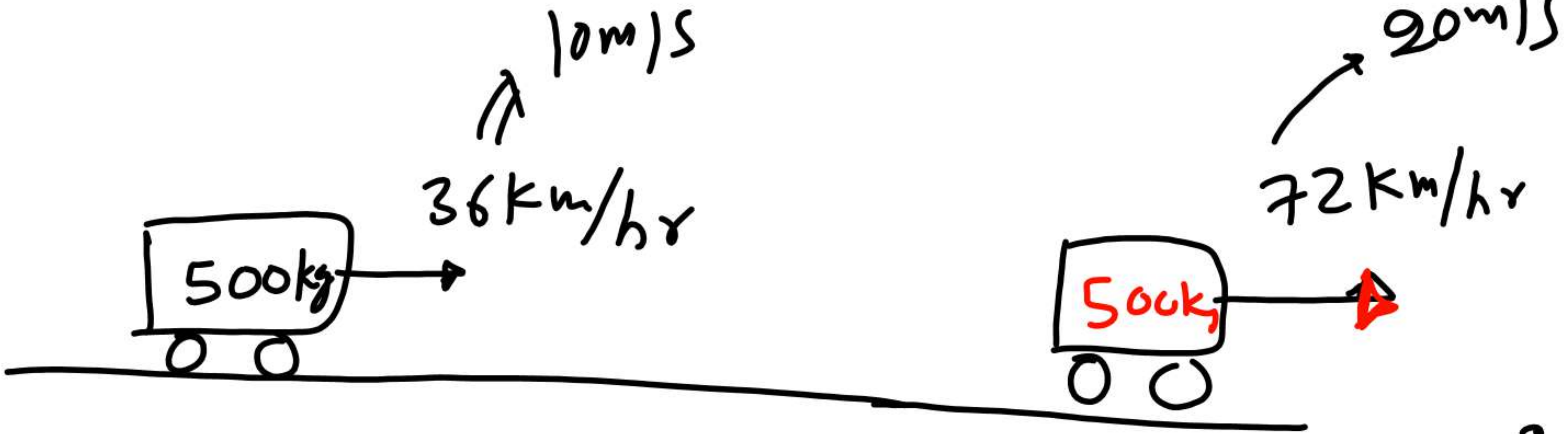
in 10 min

P_{avg} - ?

$$|P_{avg}| = \frac{mgh}{t}$$

$$= -\frac{2\times \cancel{10}\times \cancel{6}}{10\times \cancel{60}}$$

$$= -\frac{1}{5}\,W$$



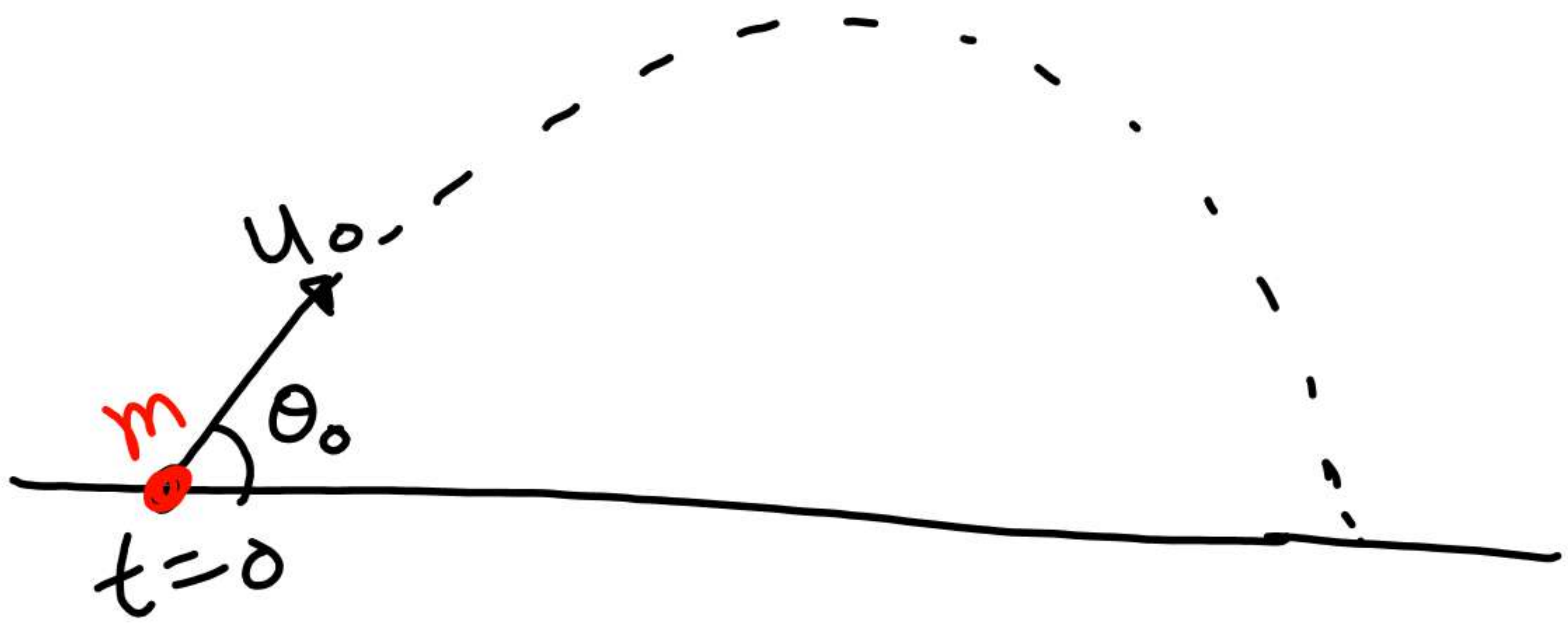
in 1 min

$P_{avg} = ?$

$$P_{avg} = \frac{\frac{1}{2}500(20)^2 - \frac{1}{2}500(10)^2}{1 \times 60}$$

$$= 250 \times 3\cancel{0}05$$

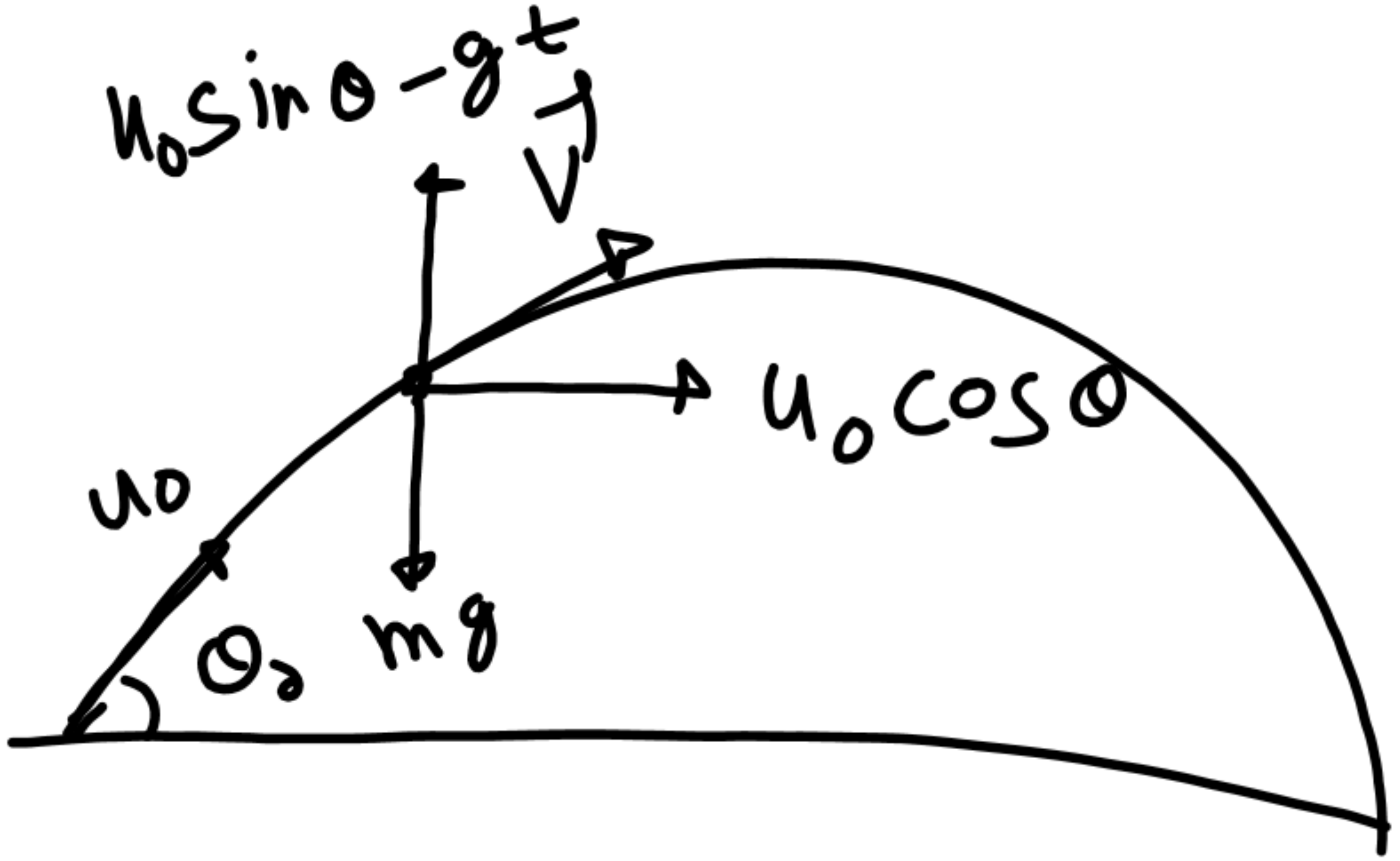
$$= 1250W$$



find

(i) inst Power of gravity at any time 't'

(ii) avg. Power delivered by gravity in time interval $(0 \to t)$



(i) $P = \vec{F} \cdot \vec{V}$

$$P = (-mg\hat{j}) \cdot \left(u_0\cos\theta\,\hat{i} + (u_0\sin\theta - gt)\hat{j} \right)$$

$$P = -mg(u_0\sin\theta - gt)$$

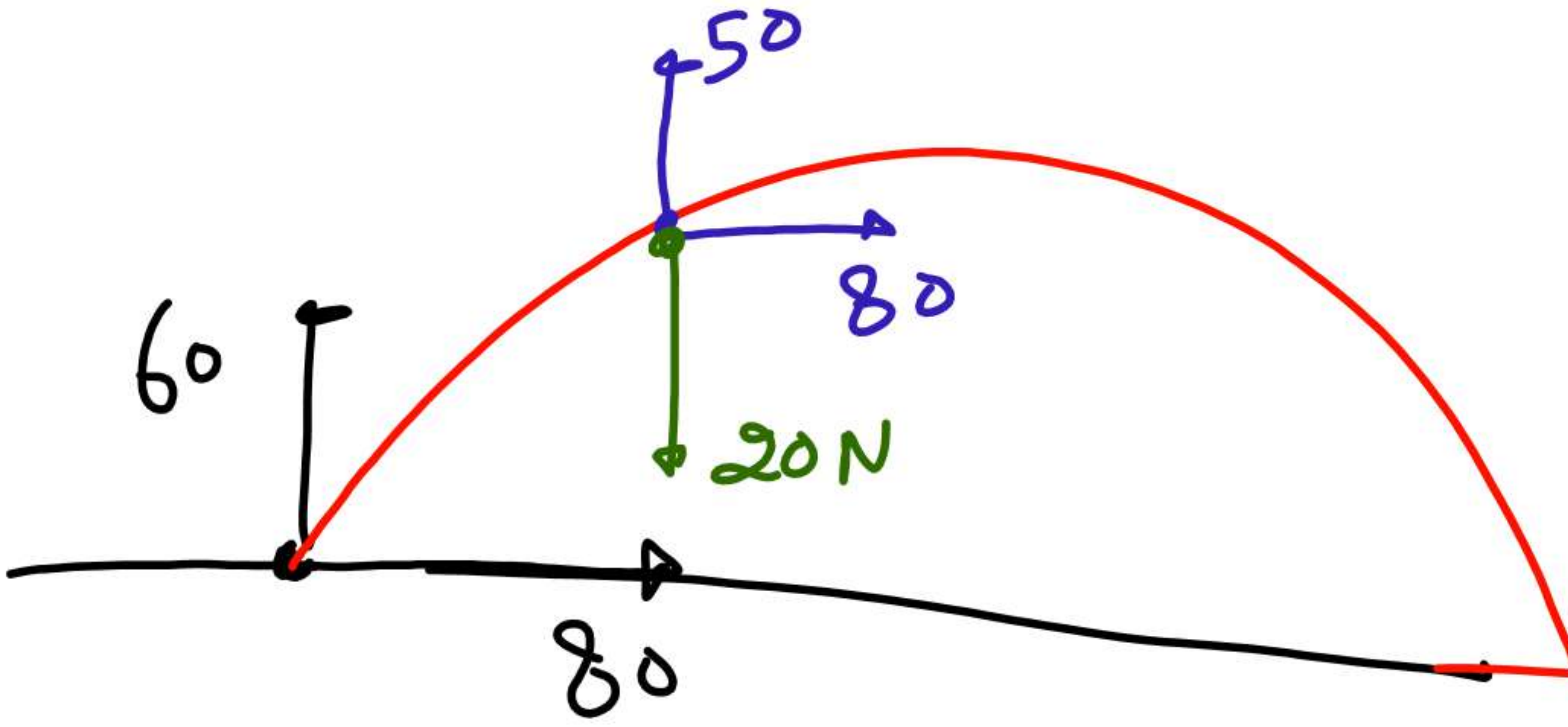
$$P_{avg} = \frac{\int P\,dt}{\int_{\tau} dt}$$

$$= \frac{\int_0 -mg\,(u_0 \sin\theta_0 - gt)\,dt}{\int_0^t dt} = -mg\,u_0 \sin\theta_0 - \frac{mgt^2}{2}$$

find

(i) Power of gravity at t=15sec.

(ii) Power delived by gravity for entire Journey.



(i) $P = \vec{F} \cdot \vec{v}$

$= (-20\hat{j}) \cdot (80\hat{i} + 50\hat{j})$

$= -1000\,W$

(ii) $(P_{avg}) = \dfrac{W}{t}$

$(P_{avg})_{entire} = \dfrac{0}{t}$

$V_y = u_y + a_y t$

$= 60 - 10 \times 1$

$= 50$

$$\left(\left(P_{avg}\right)_{mg}\right)_{\text{half Journey}} = \frac{-mgh_{max}}{T/2}$$

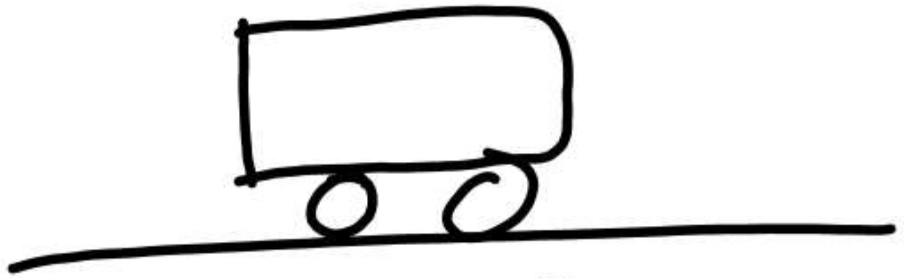
$$h_{max} = \frac{u_y^2}{2g} = \frac{(60)^2}{20}$$

$$= \frac{-\cancel{2}\times 10\left(\frac{(60)^2}{\cancel{20}}\right)}{\cancel{60}/\cancel{10}}$$

$$= \frac{-60\times \cancel{60}^{10}}{\cancel{6}}$$

$$= -600\,W.$$

$t=0$ Const Power $= P_0$



$x=0$

$u=0$

$v \propto t^{1/2}$

find $v=f(t)$

$x=f(t)$

K

$v = \sqrt{\frac{2P_0}{m}}\, t^{1/2}$

$P_0 = Fv$

$P_0 = mav$

$P_0 = m\frac{dv}{dt}v$

$\frac{P_0}{m}\int_0^t dt = \int_0^v v\,dv$

$\frac{P_0}{m}t = \frac{v^2}{2}$

$$v = k\,t^{1/2}$$

$$\frac{dx}{dt} = k\,t^{1/2}$$

$$\int_0^x dx = k\int_0^t t^{1/2}\,dt$$

$$x = k\,\frac{t^{3/2}}{3/2}$$

$$x = \frac{2}{3}k\,t^{3/2}$$

$$x = \frac{2}{3}\sqrt{\frac{2P_0}{m}}\,t^{3/2}$$

$$x \propto t^{3/2}$$