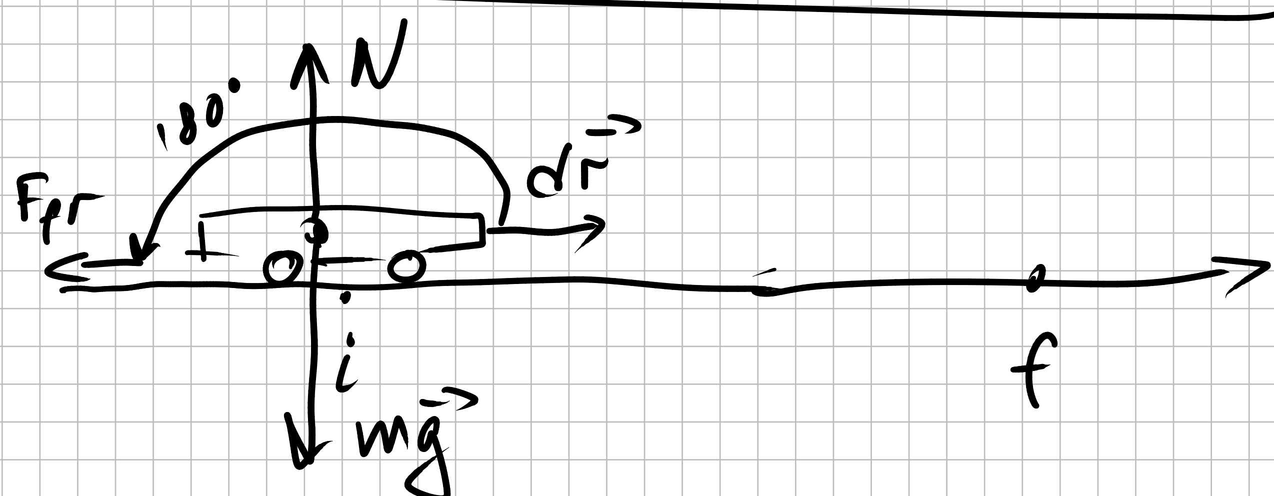
Total energy.

$$\boxed{E = K + U = \frac{mv^2}{2} + mgy}$$

E conserved iff there is no work of non-conservative forces

$$\boxed{\Delta E = E_f - E_i = W_{n.c.f}}$$

$$W = \int_i^f \vec{F} \cdot d\vec{r} = \int_i^f |F| \cdot |dr| \cdot \cos\theta$$



Cars

Power

$$P = \frac{dW}{dt} = \left[\frac{J}{s}\right] = [W]$$

Watt.

$$P = \frac{dW}{dt} = \frac{d\left(\int_{\Delta t} \vec{F} \cdot d\vec{r}\right)}{dt} \overset{\text{iff } \vec{F} \text{ - constant}}{=} \frac{\vec{F} \cdot d\vec{r}}{dt}$$

$$\boxed{P = \vec{F} \cdot \vec{v}}$$

$\vec{F}$ is const

Chose a car, Look at

mi/g , horse power,

size of the car,

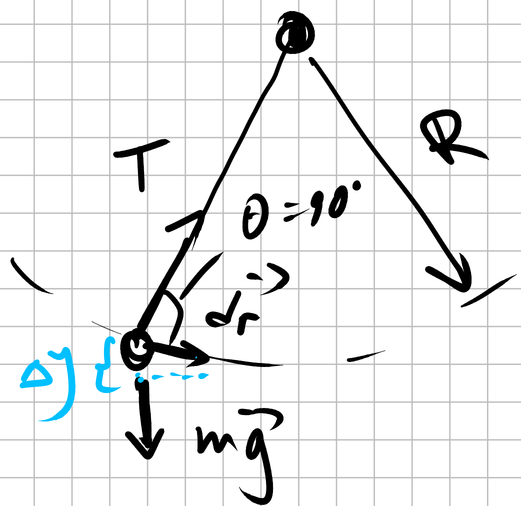
mass

h.p. = horse power = 746 W

$mg \cdot \Delta y = \Delta U$

$E = \frac{mv^2}{2} + mgy$

$\Delta E = W$



$W_T = 0$

$-W_g = mg\,\Delta y$

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

$\Delta E = \frac{m v_f^2}{2} = P \cdot \Delta t$

$v_f = 70\ \text{mi/h} \approx 31\ \text{m/s}$

$m = 1.5\ \text{T} = 1500\ \text{kg}$

$P = 160\ \text{hp}$

$1\ \text{hp} = 746\ \text{W}$

$$\Delta t = \left(\frac{P}{m v_f^2/2}\right)^{-1} = \left(\frac{2\cdot P}{m\cdot v_f^2}\right)^{-1} = \frac{m v_f^2}{2\cdot P}$$

$$= \frac{\cancel{1500}\,\text{kg}\cdot(31\,\text{m/s})^2}{2\cdot\cancel{160}\,\text{hp}\cdot 746\,\frac{\text{W}}{\text{hp}}} = \frac{10\cdot\cancel{900}}{2\cdot\cancel{746}} \simeq 5\,\text{sec}$$

$$=$$