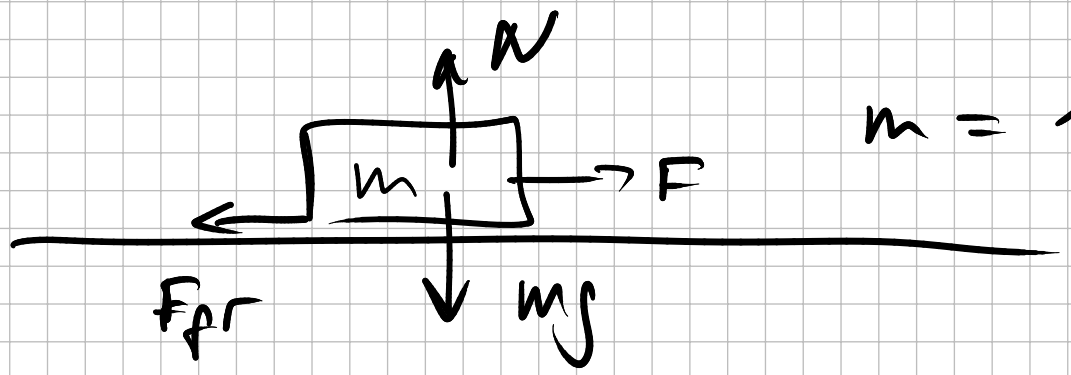
Car on a horizontal surface



$m = 1000\,kg$

$$F_{fr} + F_d = \mu N + \frac{1}{2}\rho v^2 C \cdot A$$

$$0.01 \cdot 1000 \cdot g$$

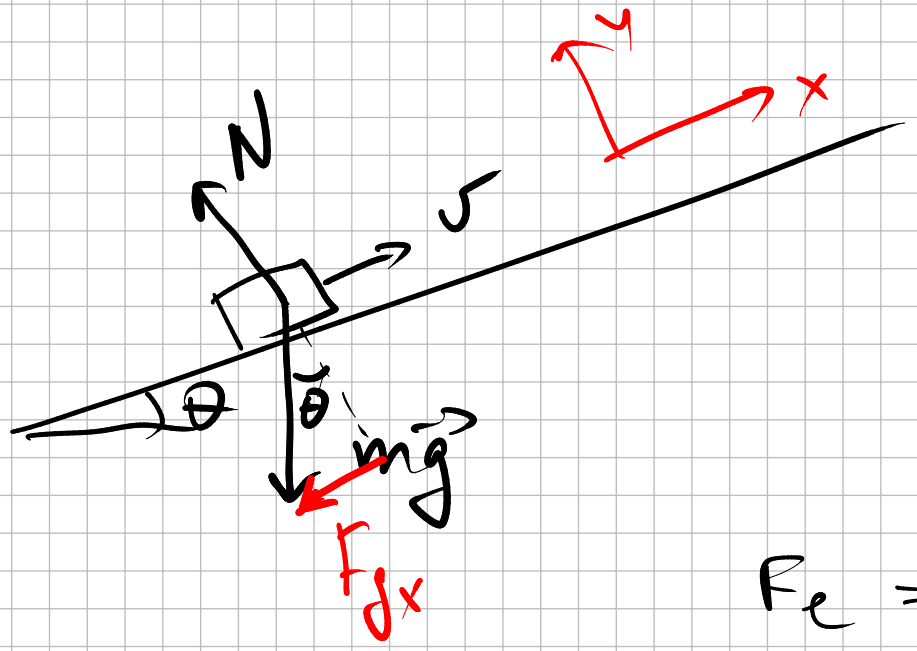
$$\approx 100\,N + \underbrace{\frac{1}{2} 1.2 \cdot \left(22 \tfrac{m}{s}\right)^2 \cdot 0.5 \cdot 4}$$

$$\approx 600\,N$$

$$F = 700\,N$$

$$P = F \cdot v = 700 \cdot 22 = \frac{15500\,W}{735\,W/hP}$$

$$\approx 20\,hP$$



$$F_{gx} = -mg\sin\theta$$

$$F_e = -F_{gx} + \underbrace{F_{fr} + F_d}_{700\,N}$$

as before

$$F_e = mg\sin\theta + 700\,N$$

$$\theta = 30°$$

$$F_e = 1000\,kg \cdot 10\,\frac{m}{s^2}\,\underbrace{\sin 30°}_{1/2} + 700\,N$$

$$= 5000\,N + 700\,N$$

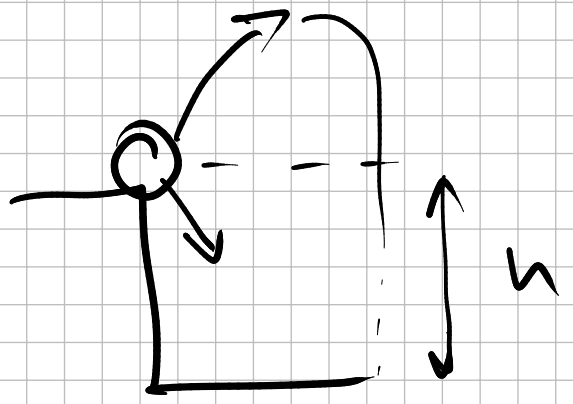
$$P_e = F_e \cdot v = 5700\,N \cdot 22\,m/s = 114000\,W$$

$$\text{Jo HP} \qquad P_e = \frac{114.1000\ W}{735\ W/HP} \simeq 130\ HP$$

Energy conservation

Work of non conservative forces $= 0$

$$U + K = E = \text{const}$$



$$U_i + K_i = U_f + K_f$$

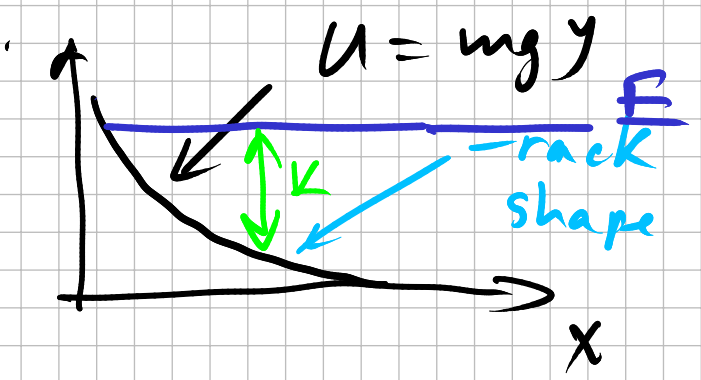
$$-(U_f - U_i) = K_f - K_i$$

$$-mgh$$

$$\frac{m v_f^2}{2} = K_f = K_i + mgh$$

$$U + K = E = \text{const}$$

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



$$v = \sqrt{\frac{2E - 2mg}{m}} = \sqrt{2\left(\frac{E}{m} - g\right)}$$

Sources of Energy

$E \rightarrow [\,J\,]$

$[cal] = 4{,}2\,[J]$

$Cal = kcal = 4200\,[J] =$

Daily intake $\approx$ 3000 kcal

$\approx 12\,000\,000\,[J]$

$\simeq 12\,MJ$

$$E = 12\,MJ = \Delta U \Rightarrow mgh$$

$$12\,MJ = 100\,kg \cdot 10\,\frac{m}{s^2} \cdot h$$

$$h = \frac{12 \cdot 10^6}{100 \cdot 10} = 12 \cdot 10^3\,m = 12\,km$$