IV|2

$m = 1500\,kg$

$\Delta t = 3{,}1\,s$

$v = 100\,km/h$ ↓ m/s

$27{,}8$

$\frac{km}{h} \rightarrow \frac{m}{s}$ $\quad \frac{1000}{60 \cdot 60} = \frac{1000}{3600} = \frac{1}{3{,}6}$

---

a.) $F = m \cdot a$

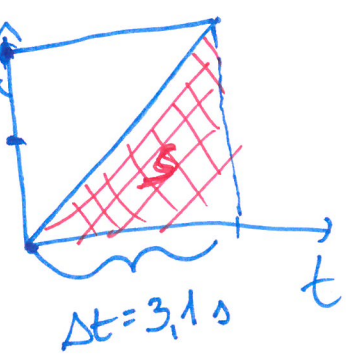
$a = \frac{\Delta v}{\Delta t} = \frac{27{,}8\,m/s}{3{,}1\,s} = \underline{\underline{8{,}97\,m/s^2}}$

$F = 1500\,kg \cdot 8{,}97\,m/s^2 = 13452\,\frac{k \cdot m}{s^2}\,[N]$

↓

$\underline{\underline{13{,}452\,kN}}$

b.)



$s = \frac{v_{max}}{2} \cdot \Delta t = \frac{27{,}8\,m/s}{2} \cdot 3{,}1\,s =$

↓ $\bar{v}$

$\underline{\underline{43{,}1\,m}}$

IV | 5

$F_{zug} = 105\,N$

$F_{Reibung} = 15\,N$

$m = 25\,kg$

$\Delta t = 5\,s$

---

a.) $\Sigma F = F_{zug} - F_{Reibung} = 105N - 15N = \underline{90N}$

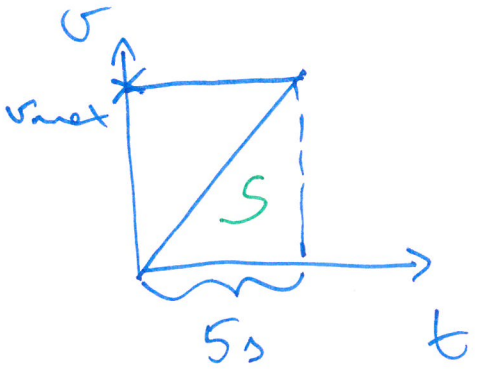
$$\Sigma F = m \cdot a$$

$$a = \frac{\Sigma F}{m} = \frac{90\,N}{25\,kg} = \underline{3{,}6\,m/s^2}$$

b.) $a = \frac{\Delta v}{\Delta t} = \frac{v_{max}}{\Delta t}$ $\quad \Delta t = 5\,s$

$$v_{max} = a \cdot \Delta t = 3{,}6\,\frac{m}{s^2} \cdot 5\,s = \underline{18\,\frac{m}{s}}$$

c.)



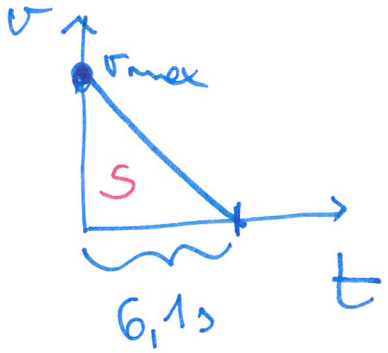
$$s = \bar{v} \cdot \Delta t = \frac{v_{max}}{2} \cdot \Delta t =$$

$$\frac{18\,m/s}{2} \cdot 5\,s = \underline{45\,m}$$

IV | 6 $m = 20\,kg$

$\Delta t = 6{,}1\,s$

$s = 9{,}2\,m$



a.) $s = \frac{v_{max}}{2} \cdot \Delta t$

$2s = v_{max} \cdot \Delta t$

$v_{max} = \frac{2 \cdot s}{\Delta t} = \frac{9{,}2\,m \cdot 2}{6{,}1\,s} = \underline{\underline{3{,}02\,m/s}}$

b.) $a = \frac{\Delta v}{\Delta t} = -\frac{3{,}02\,m/s}{6{,}1\,s} = -0{,}495\,m/s^2$

c.) $F_{Friction} = m \cdot a = 20\,kg \cdot (-0{,}495\,m/s^2) = -9{,}9\,N$

$\frac{kg \cdot m}{s^2} \rightarrow N$

IV|8

$m_1 = 200.000$ tons $= 2 \cdot 10^8$ kg

$m_2 = 300.000$ tons $= 3 \cdot 10^8$ kg

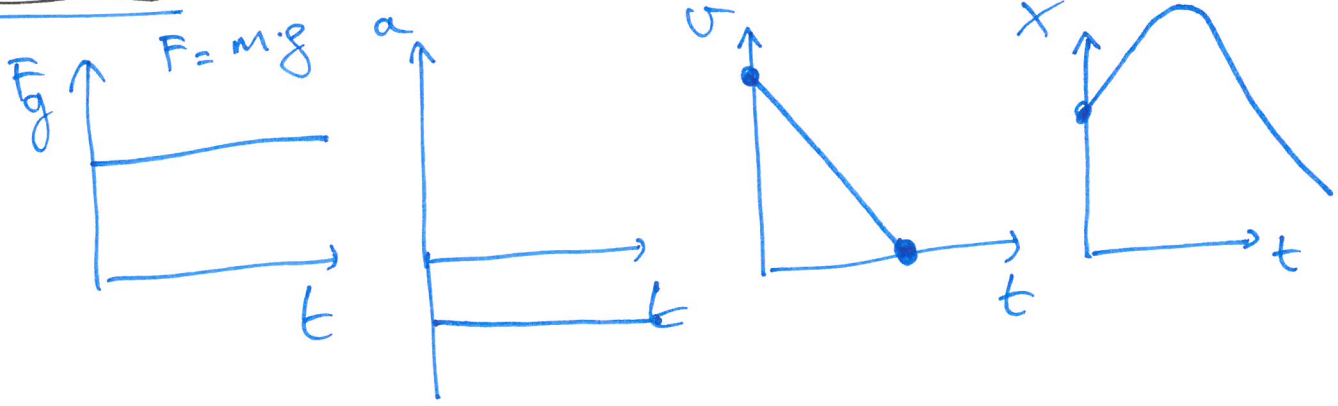
1 ton = 1000 kg

$r = 2\,km = 2000\,m$

$$F = G \frac{m_1 \cdot m_2}{r^2} = 6{,}67 \cdot 10^{-11} \frac{m^3}{kg \cdot s^2} \frac{2 \cdot 10^8 kg \cdot 3 \cdot 10^8 kg}{(2000\,m)^2} =$$

$$\frac{m \cdot kg}{s^2} = N \approx 1N$$

IV|13a

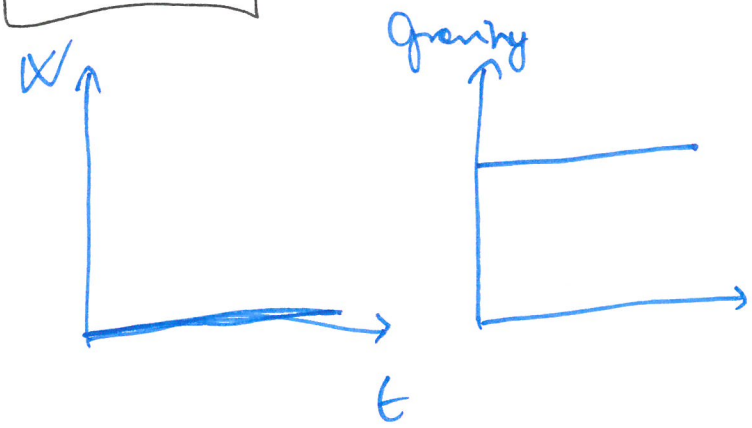


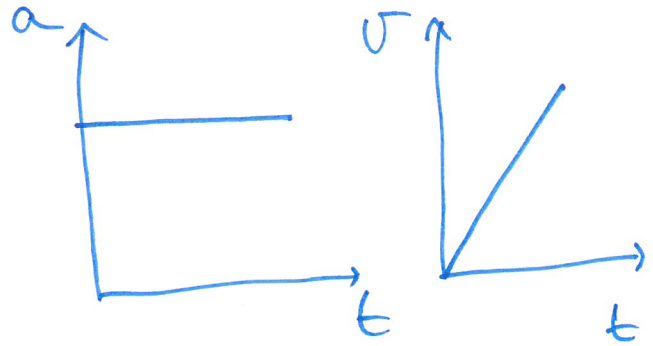
elevator problem

$W = m \cdot g + m \cdot a$

$W = mg - ma$

IV | 13c





IV | 11

$m = 2\,kg$

$x = 25\,cm = 0{,}25\,m$

$$\sum F = 0$$

$$0 = F_{spring} - mg$$

$$F = m \cdot g = 2\,kg \cdot 9{,}81\,\frac{m}{s^2} = 19{,}62\,N$$

spring constant

$$F = -k \cdot x$$

$$D = k = \frac{\Delta F_{external}}{\Delta x} = \frac{F}{x} = \frac{19{,}62\,N}{0{,}25\,m} = 78{,}5\,\frac{N}{m}$$

IV/136

higher opening constant — smaller extension

10% is the smallest if the original lenght was the smallest