

Week 2 (1)

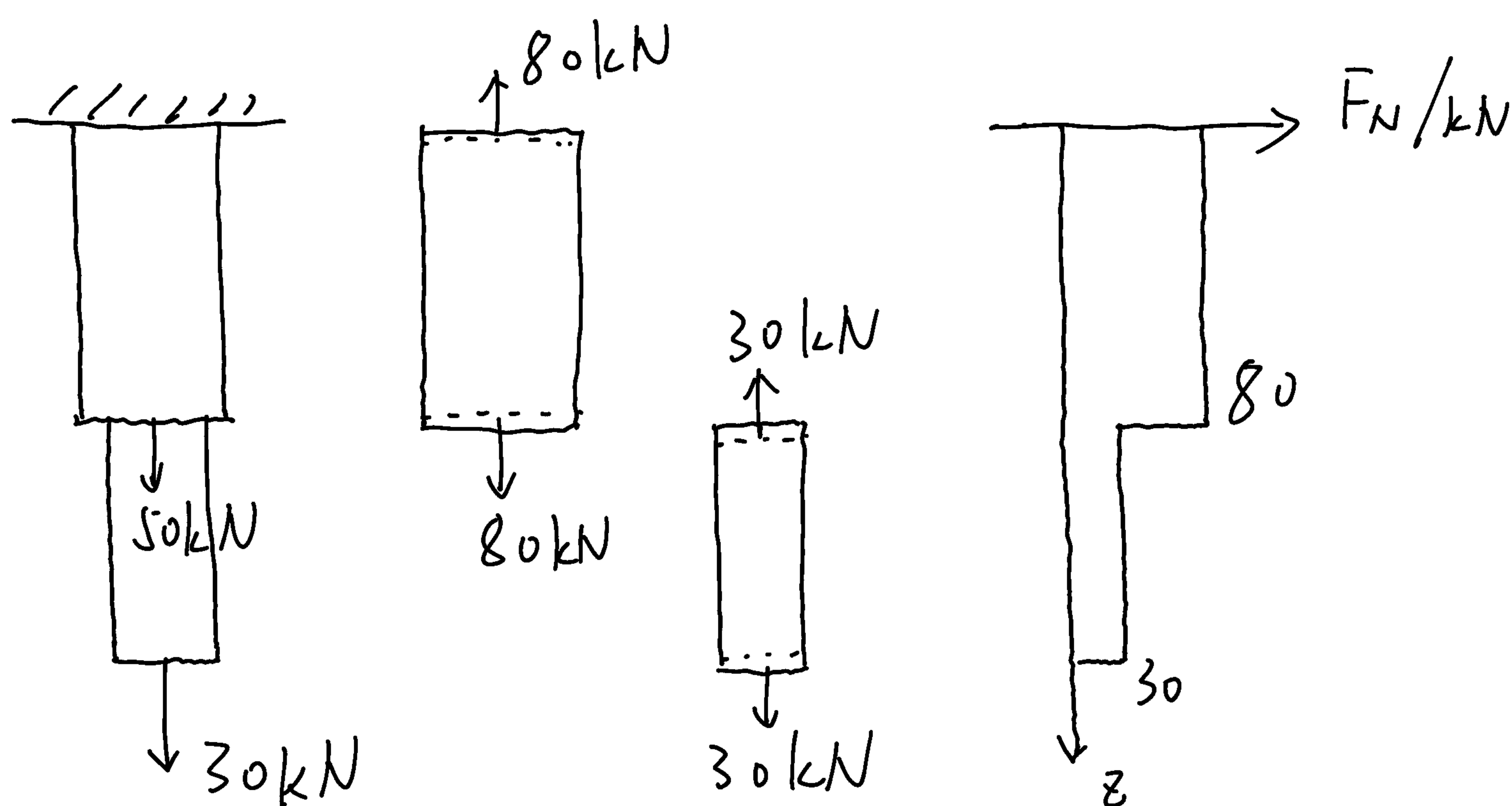
1-6

C 合理:

- x 方向受合力为 0 \Rightarrow AB 错
- 应力连续 \Rightarrow 应力在 yz 平面连续 \Rightarrow D 错

2-1

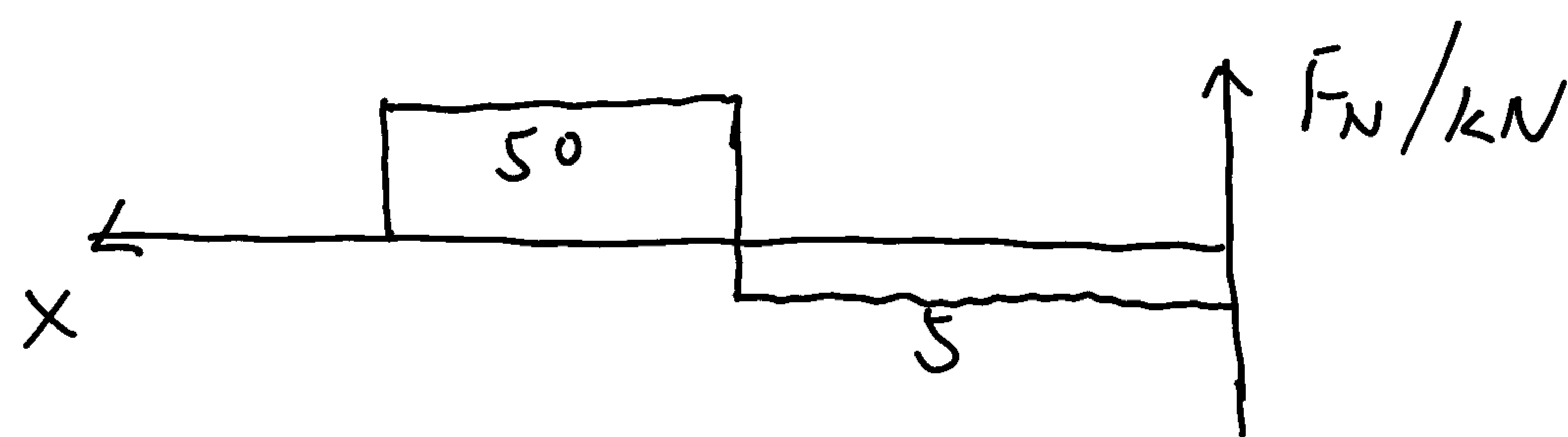
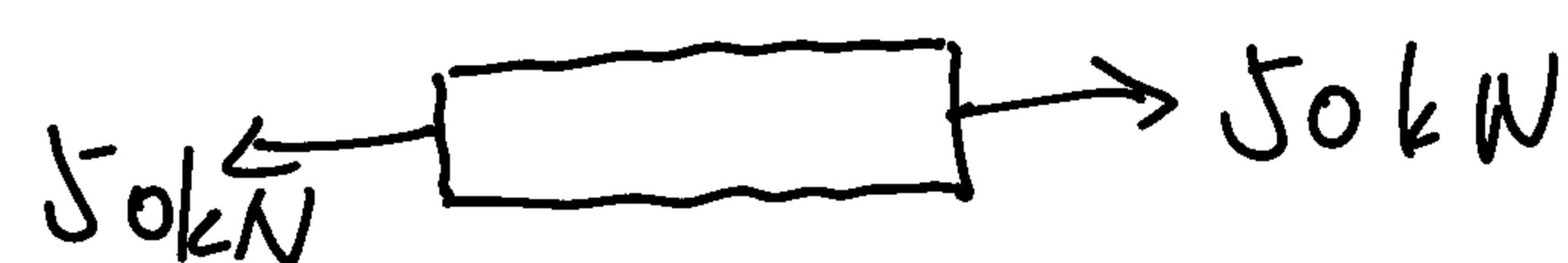
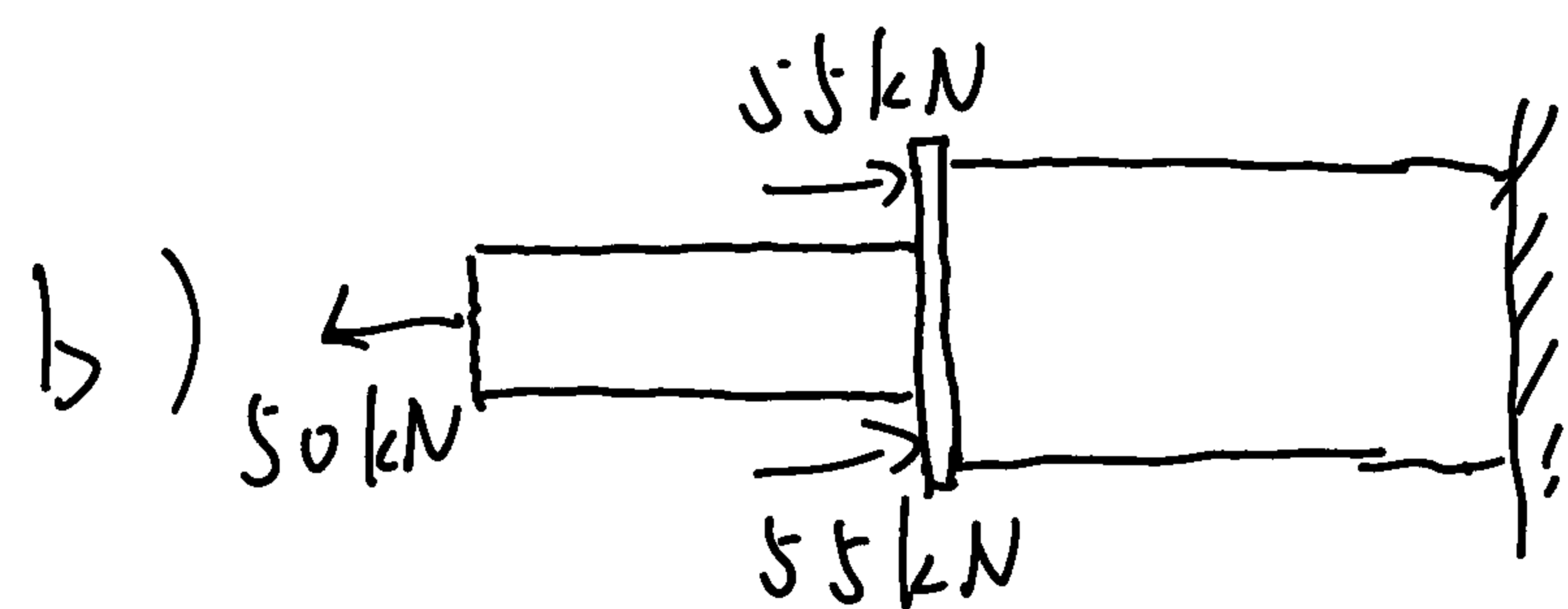
a)



$$\sigma_1 = \frac{F_{N1}}{\frac{1}{4}\pi d_1^2} = 113.18 \text{ MPa}$$

$$\sigma_2 = \frac{F_{N2}}{\frac{1}{4}\pi d_2^2} = 95.49 \text{ MPa}$$

$$\Delta x = \frac{\sigma_1}{E} \cdot l_1 + \frac{\sigma_2}{E} \cdot l_2 = 1.06 \text{ mm}$$



$$\sigma_1 = \frac{F_{N1}}{\frac{1}{4}\pi d_1^2} = -1.51 \text{ MPa}$$

$$\sigma_2 = \frac{F_{N2}}{\frac{1}{4}\pi d_2^2} = 44.09 \text{ MPa}$$

$$\Delta x = \frac{\sigma_1}{E} \cdot l_1 + \frac{\sigma_2}{E} \cdot l_2 = 0.19 \text{ mm}$$

Week 2 (2)

2-3

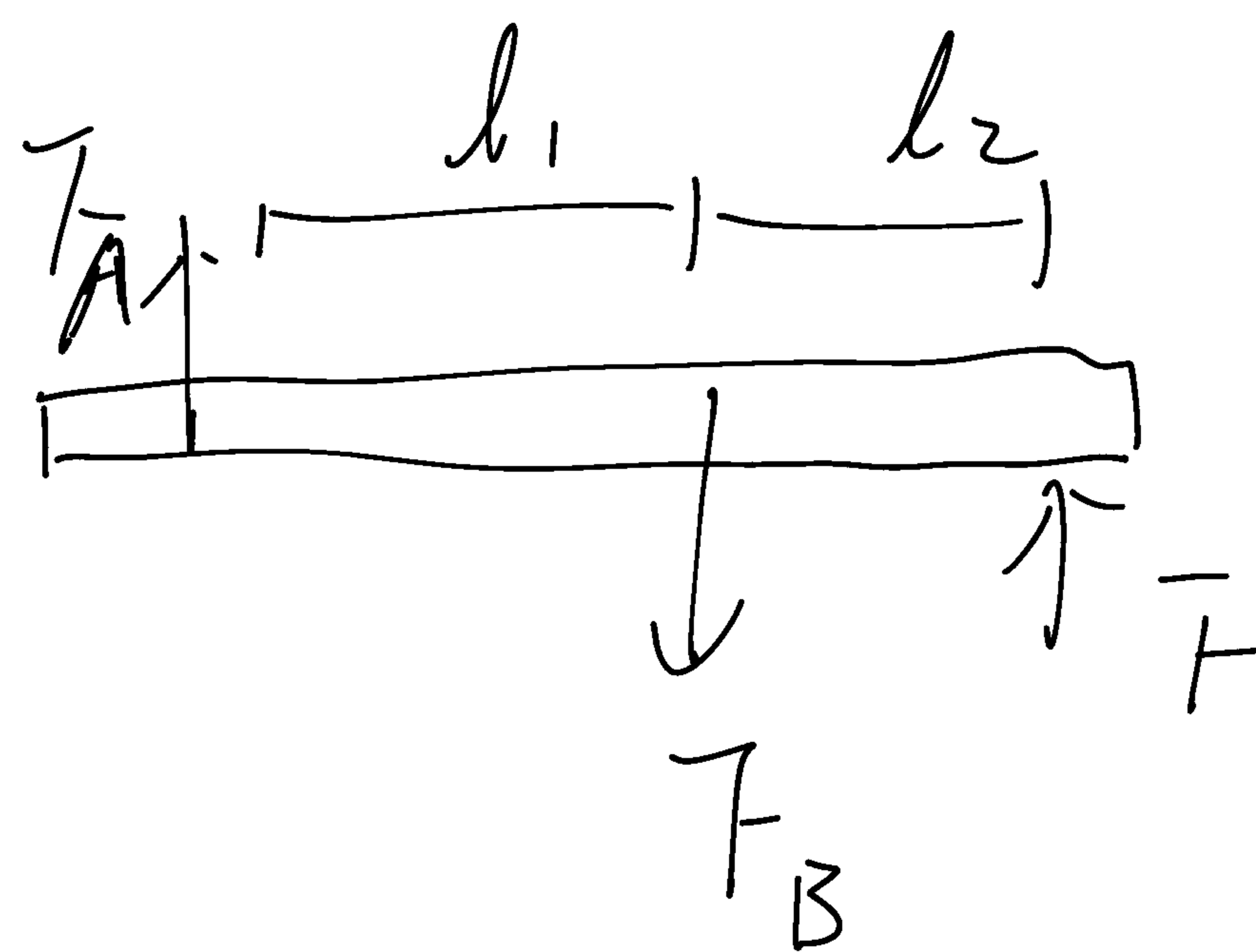
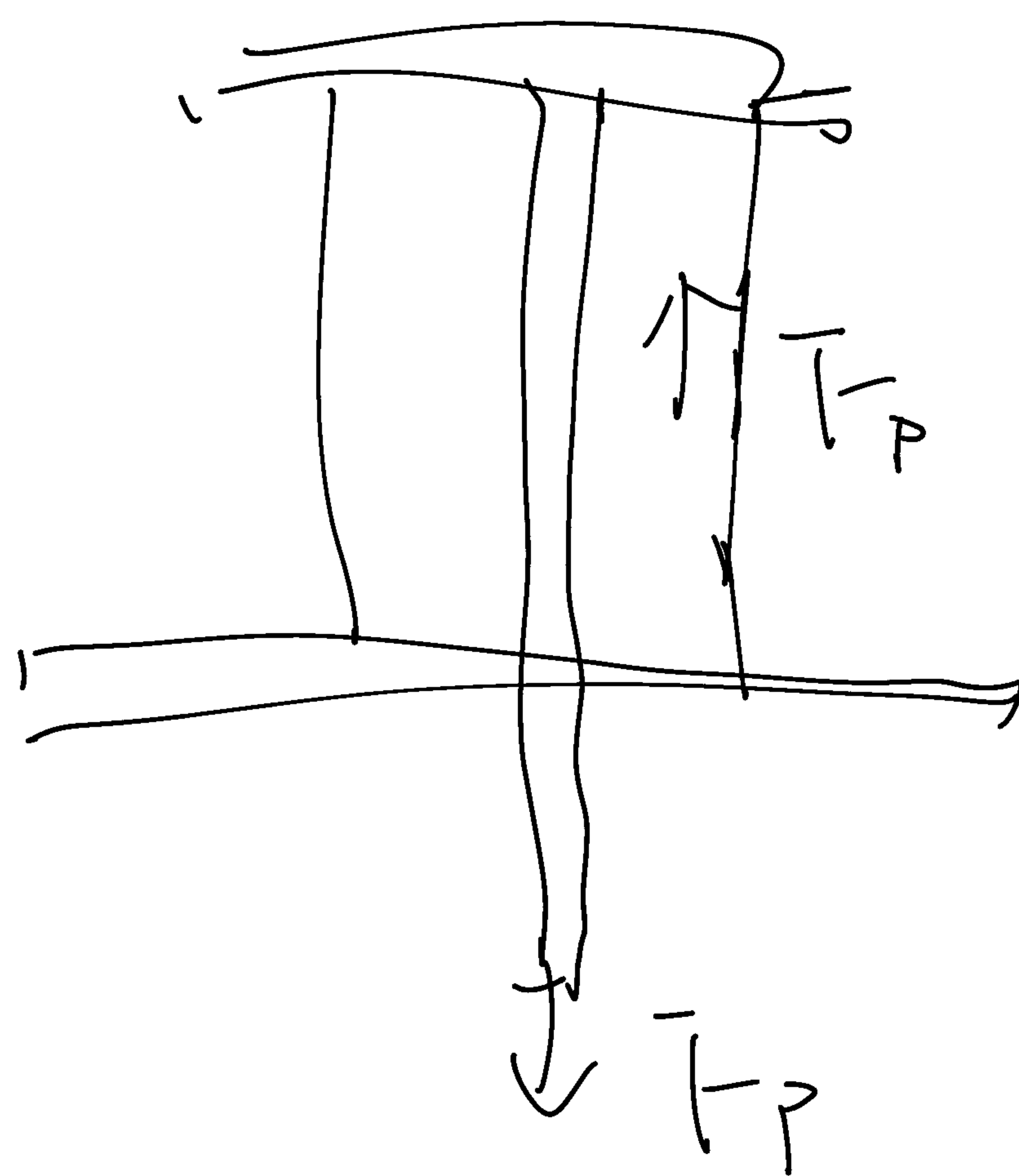
$$\sigma_1 = \frac{F_P}{A} = 54.5 \text{ MPa}$$

$$\sigma_2 = \frac{F_P}{\frac{1}{4}\pi d^2} = 339.5 \text{ MPa}$$

$$x_1 = \frac{\sigma_1 l_1}{E_1} = 0.94 \text{ mm}$$

$$x_2 = \frac{\sigma_2 l_2}{E_2} = 3.57 \text{ mm}$$

$$\Rightarrow \Delta x = x_1 + x_2 = 4.50 \text{ mm}$$



2-5

$$F_A = F \cdot \frac{l_2}{l_1} = 2 \text{ kN}$$

$$F_B = F \cdot \frac{l_1 + l_2}{l_1} = 6 \text{ kN}$$

$$\sigma_A = \frac{F_A}{\frac{1}{4}\pi d_1^2} = 13.3 \text{ MPa} < \sigma$$

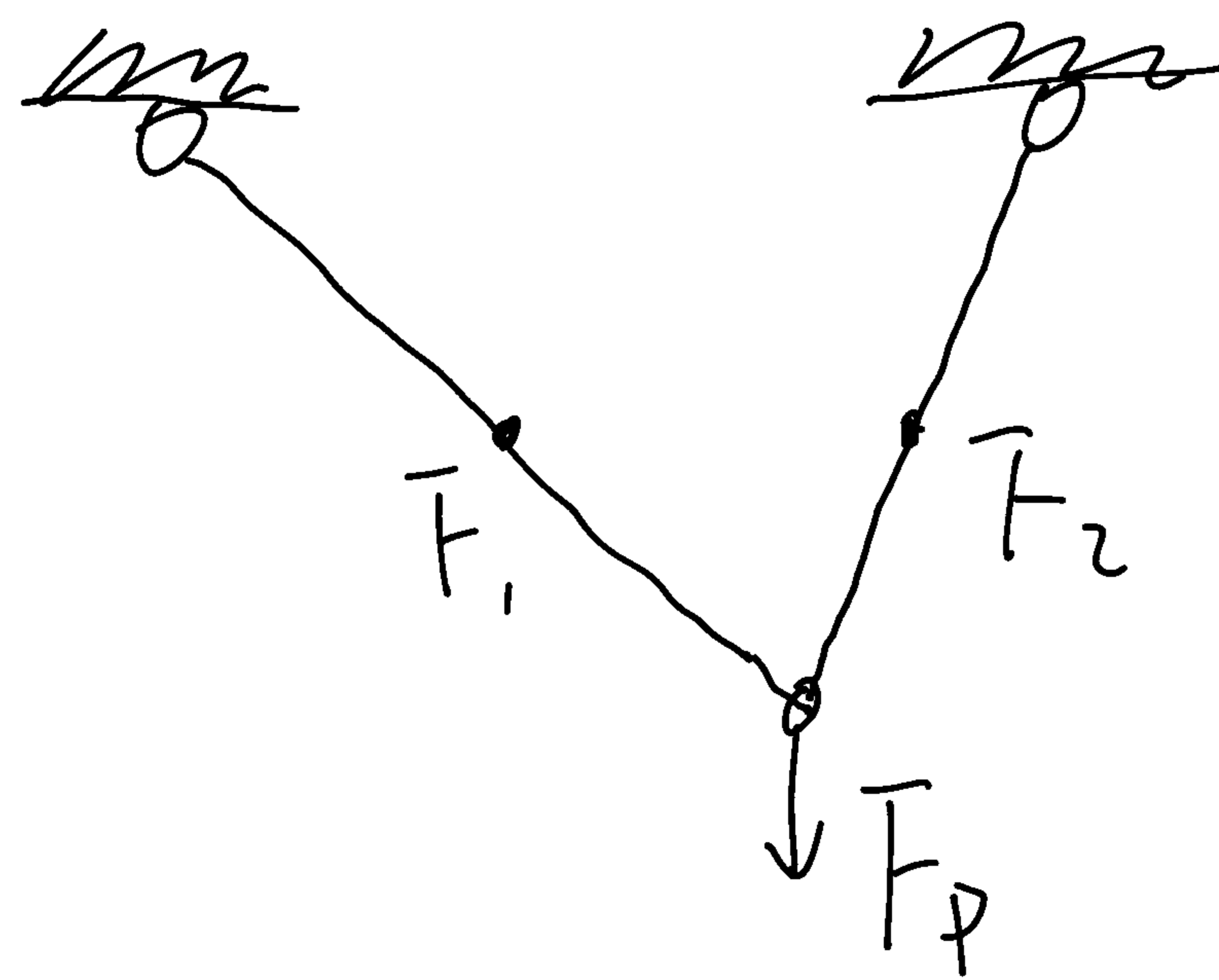
$$\sigma_B = \frac{F_B}{\frac{1}{4}\pi d_2^2} = 25.8 \text{ MPa} < \sigma$$

\Rightarrow 安全

2-7

$$\begin{cases} \bar{F}_1 \cos 45^\circ + \bar{F}_2 \cos 30^\circ = \bar{F}_P \\ \bar{F}_1 \sin 45^\circ = \bar{F}_2 \sin 30^\circ \end{cases}$$

$$\Rightarrow \begin{cases} \bar{F}_1 = \frac{\sqrt{2}}{1+\sqrt{3}} \bar{F}_P \\ \bar{F}_2 = \frac{2}{1+\sqrt{3}} \bar{F}_P \end{cases}$$



$$\bar{F}_2 > \bar{F}_1 \Rightarrow \bar{F}_2 = \sigma \cdot \frac{1}{4} \pi d^2$$

$$\Rightarrow \bar{F}_P = \frac{1+\sqrt{3}}{2} \cdot \sigma \cdot \frac{1}{4} \pi d^2 = 67.38 \text{ kN}$$

2-8

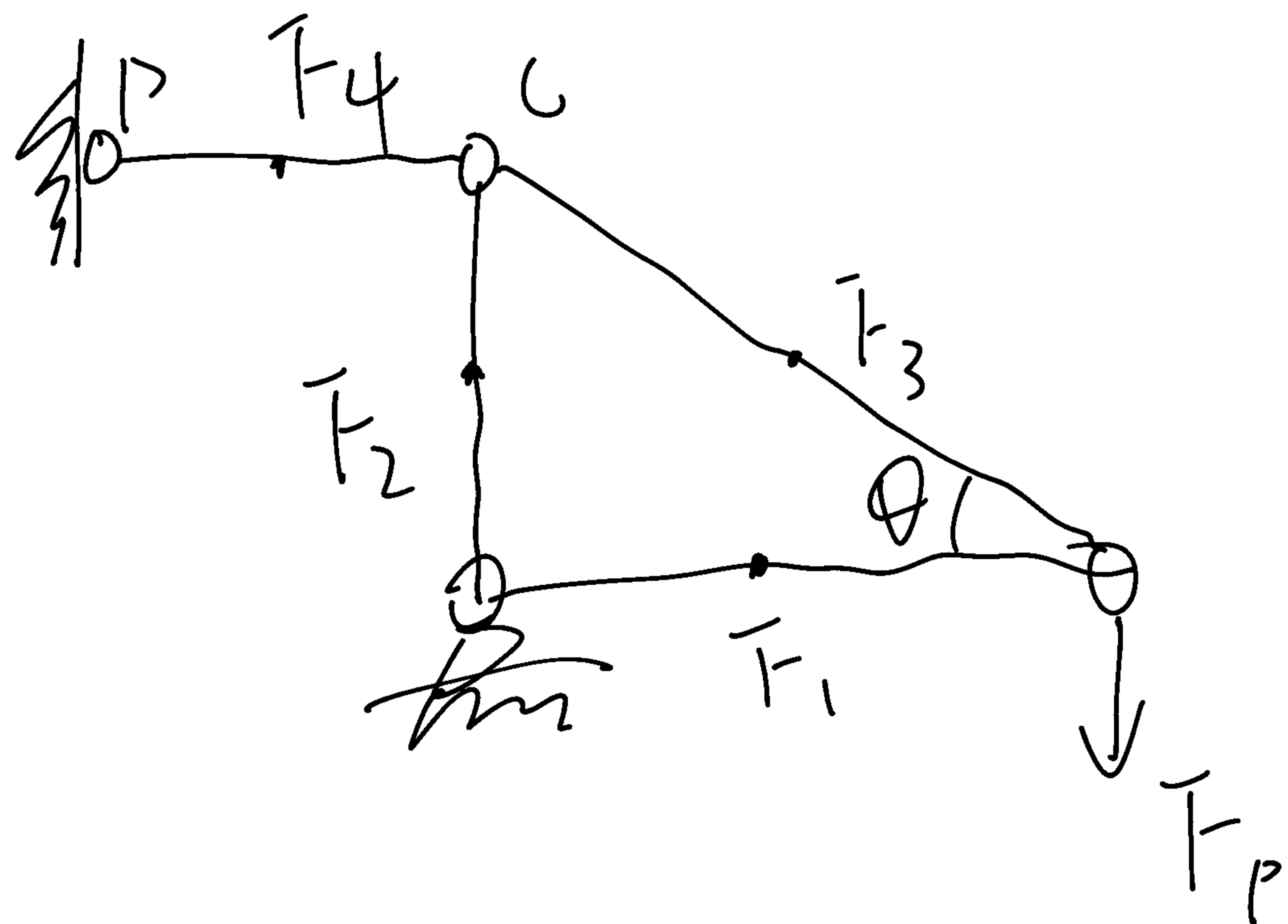
$$\begin{cases} \bar{F}_P = \bar{F}_3 \sin \theta \\ \bar{F}_3 \cos \theta = \bar{F}_1 \end{cases}$$

$$\begin{cases} \bar{F}_3 \cos \theta = \bar{F}_4 \\ \bar{F}_3 \sin \theta = \bar{F}_2 \end{cases}$$

$$\Rightarrow \begin{cases} \bar{F}_1 = \frac{4}{3} \bar{F}_P \\ \bar{F}_2 = \bar{F}_P \\ \bar{F}_3 = \frac{5}{3} \bar{F}_P \\ \bar{F}_4 = \frac{4}{3} \bar{F}_P \end{cases}$$

$$\bar{F}_1 > \bar{F}_2$$

$$\bar{F}_3 > \bar{F}_4$$



$$120 \times 10^6 \times 800$$

$$\begin{cases} \sigma_1 = \frac{\bar{F}_1}{A_1} = \frac{1000}{3} \bar{F}_P / \text{m}^2 \\ \sigma_3 = \frac{\bar{F}_3}{A_3} = \frac{6250}{3} \bar{F}_P / \text{m}^2 \end{cases}$$

$$\frac{\sigma_1}{\sigma_w} < \frac{\sigma_3}{\sigma_s}$$

$$\Rightarrow \bar{F}_P = \frac{3}{5} \bar{F}_3 = \frac{3}{5} \cdot \sigma_w \cdot A_3 = 57.6 \text{ kN}$$

2-9

设铝上有力 F_1 , 钢上 F_2

$$\frac{F_1}{F_2} = \frac{E_1 S_1}{E_2 S_2} = \frac{7}{15}$$

$$\text{又: } F_1 + F_2 = F = 385 \text{ kN}$$

$$\Rightarrow \begin{cases} F_1 = 122.5 \text{ kN} \\ F_2 = 262.5 \text{ kN} \end{cases}$$

$$\Rightarrow \begin{cases} \sigma_1 = -\frac{F_1}{S_1} = -61.25 \text{ MPa} \\ \sigma_2 = -\frac{F_2}{S_2} = -175 \text{ MPa} \end{cases}$$

2-11

$$\frac{F_1}{F_2} = \frac{E_1}{E_2} = 2$$

$$\text{有: } F_1 \cdot \frac{b}{2} + F_2 \cdot \frac{3}{2}b = (F_1 + F_2)x$$

$$\Rightarrow x = \frac{5}{6}b$$

2-12 B. 屈服应力是材料固有性质, 不变; 出现塑性变形后, 弹性模量 \downarrow , 韧性 \downarrow

2-13 A 脆: 压时促其结构致密, 压时相反

2-14 B 此为屈服强度定义

2-15 B 强: σ 最大处; 强: 斜率; 延: 截止处应变

2-16 C. 屈服时: σ 不变, ϵ 继续变

2-17 C 定义

2-18 D B 已屈服 \Rightarrow 沿与 OA 平行的 BD 线去.