Exercise 1

In a titanium structure you have identified the critical point where you know that your part will start to fail. You have calculated the local stress state to be

$$\overleftrightarrow{\sigma} = \begin{bmatrix} \sigma_x & \tau_{xy} & \tau_{xz} \\ \tau_{xy} & \sigma_y & \tau_{yz} \\ \tau_{xz} & \tau_{yz} & \sigma_z \end{bmatrix} = \begin{bmatrix} 85 & 0 & -15\sqrt{3} \\ 0 & -20 & 0 \\ -15\sqrt{3} & 0 & 55 \end{bmatrix} \text{MPa}$$

You know that the titanium you are using has a yield strength of 180 MPa. Use the von Mises stress criterion to determine if your part will fail, and if not how big your safety factor is.

Exercise 2

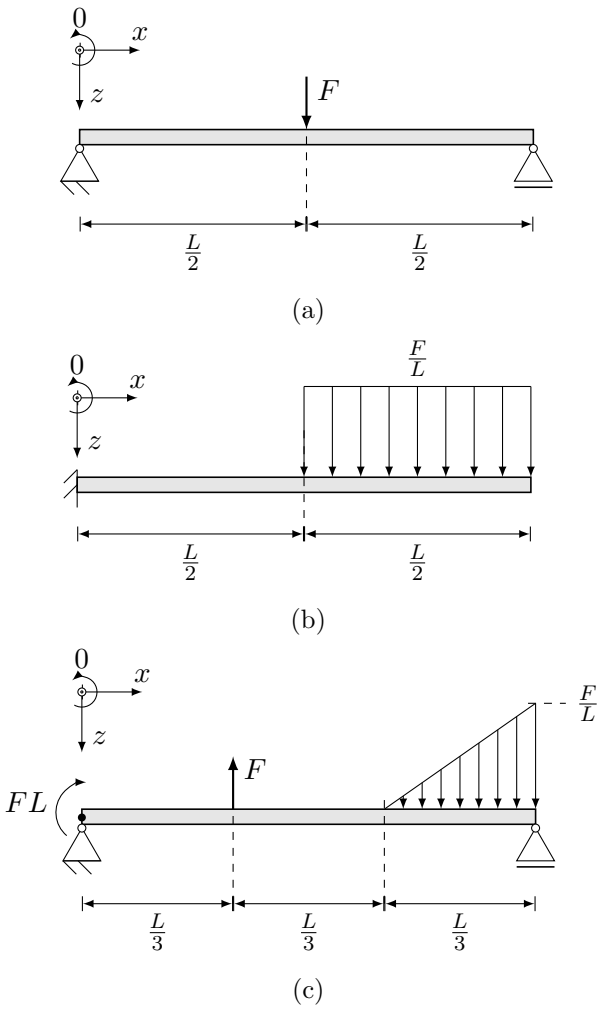

Figure 1: Different loaded beams.

The three beams as shown in figure 1 are subjected to different loads and supports. For each beam shown:

- Find the distributed load function $q(x)$.
- Determine the boundary conditions for the shear force and the moment function.
- Calculate and sketch the shear force $V(x)$ and the internal moment $M(x)$.

Exercise 3

A uniform beam is supported and loaded according to the figure 2.

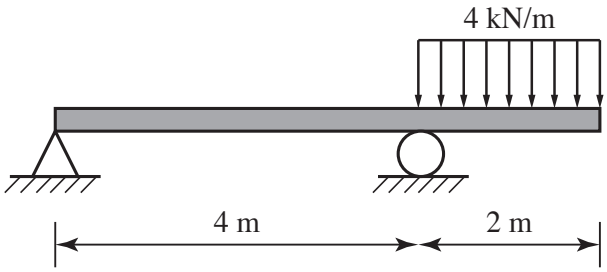

Figure 2: A supported beam under the distributed load

a) Sketch the free body diagram

b) Find reaction forces at the supports

c) Draw the shear force and moment diagram