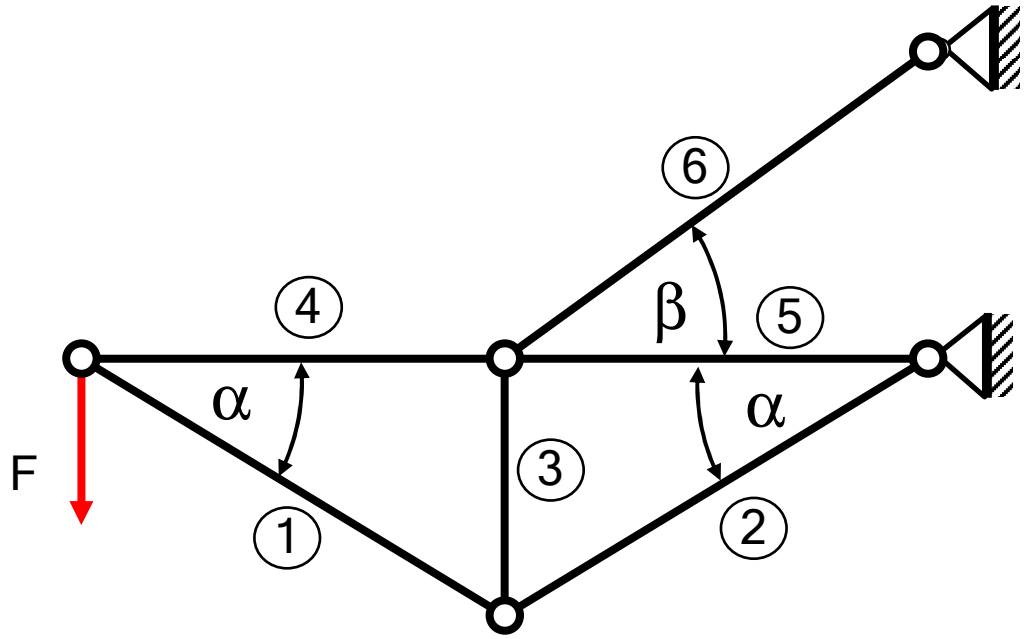
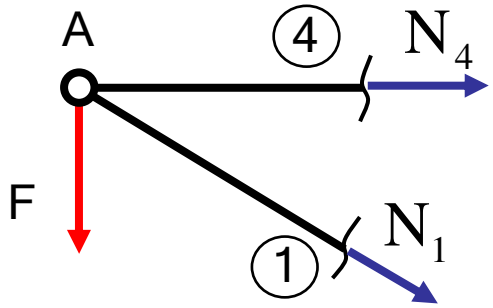
14-3. naloga: izračunajte notranje sile N_i v palicah konstrukcije v odvisnosti od sile F



a) Izračunajte notranje sile N_i v palicah v odvisnosti od sile F . Uporabite Matlab-ovo funkcijo *solve* .

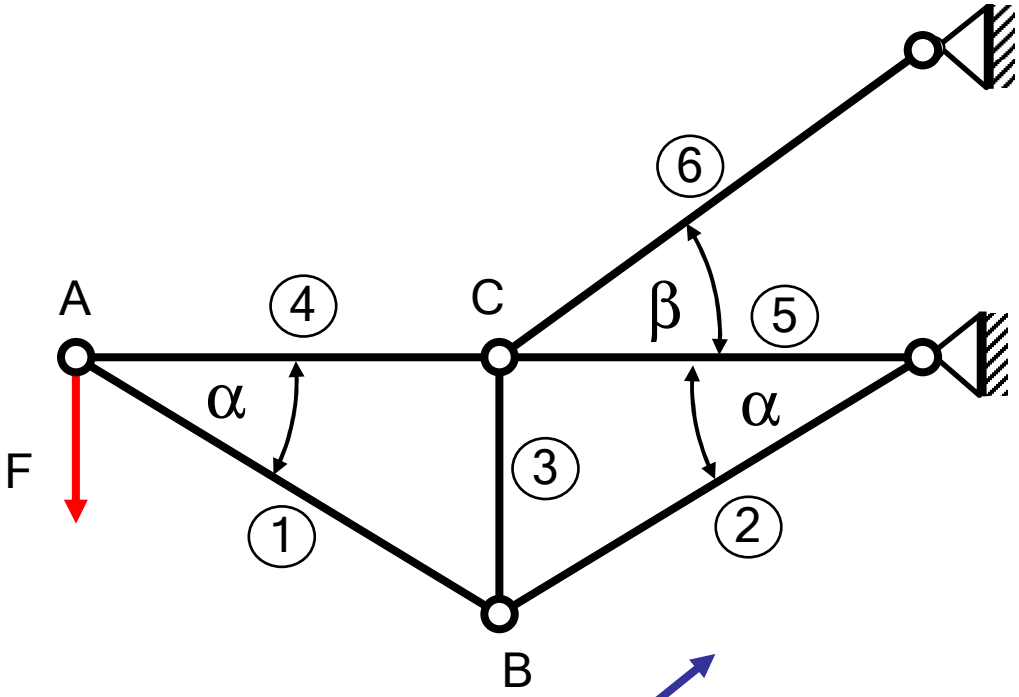
b) Za podano silo F=2kN, α=30° in β=45° izračunajte notranje sile N_i .

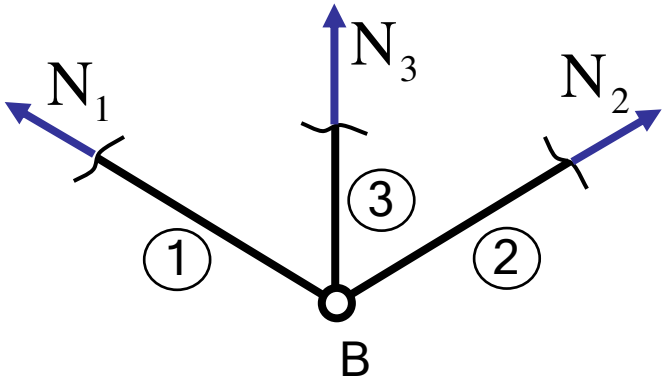
14-3. naloga: izračunajte notranje sile N_i v palicah konstrukcije v odvisnosti od sile F



$$N_4 + N_1 \cos(\alpha) = 0$$

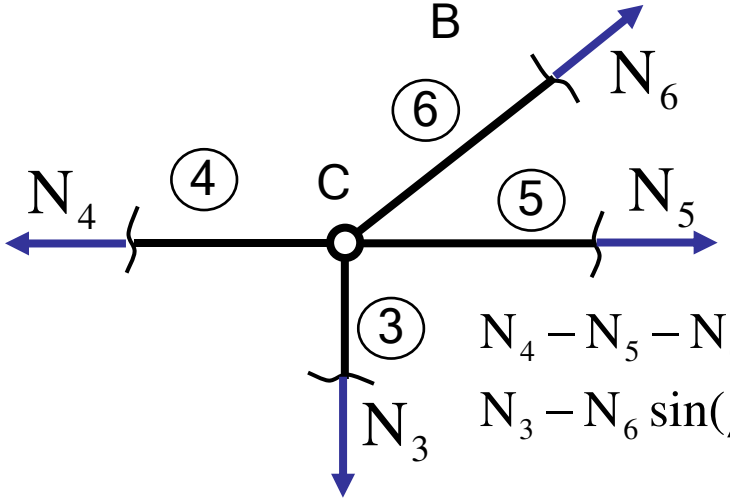
$$N_1 \sin(\alpha) + F = 0$$





$$N_3 + N_1 \sin(\alpha) + N_2 \sin(\alpha) = 0$$

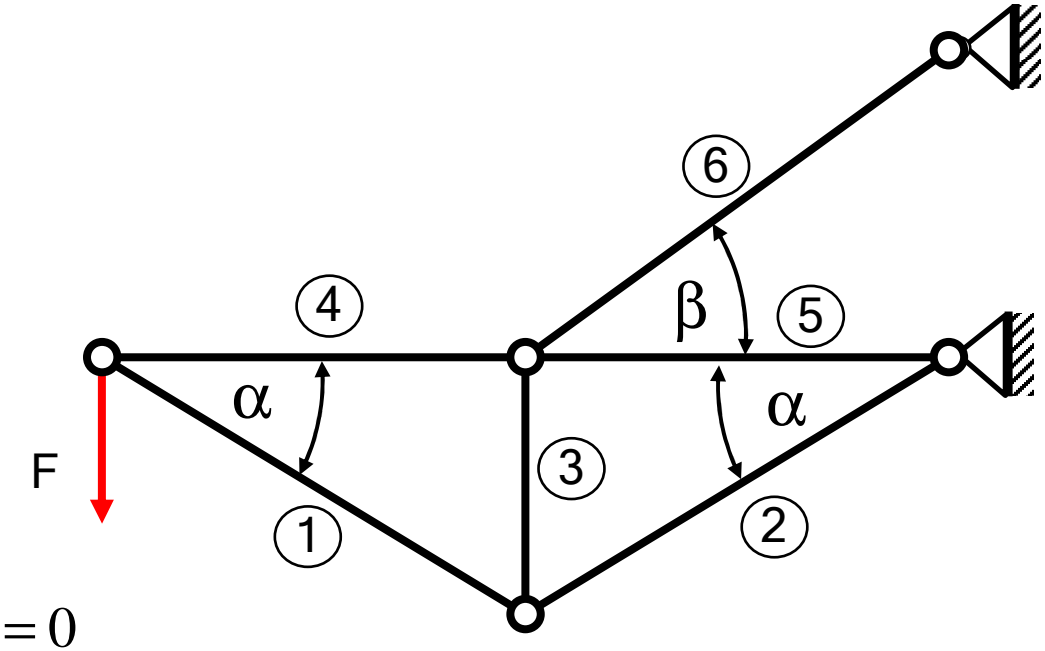
$$N_1 \cos(\alpha) - N_2 \cos(\alpha) = 0$$



$$N_4 - N_5 - N_6 \cos(\beta) = 0$$

$$N_3 - N_6 \sin(\beta) = 0$$

14-3. naloga: izračunajte notranje sile N_i v palicah konstrukcije v odvisnosti od sile F



Sistem enačb:

$$N_4 + N_1 \cos(\alpha) = 0$$

$$N_1 \sin(\alpha) + F = 0$$

$$N_3 + N_1 \sin(\alpha) + N_2 \sin(\alpha) = 0$$

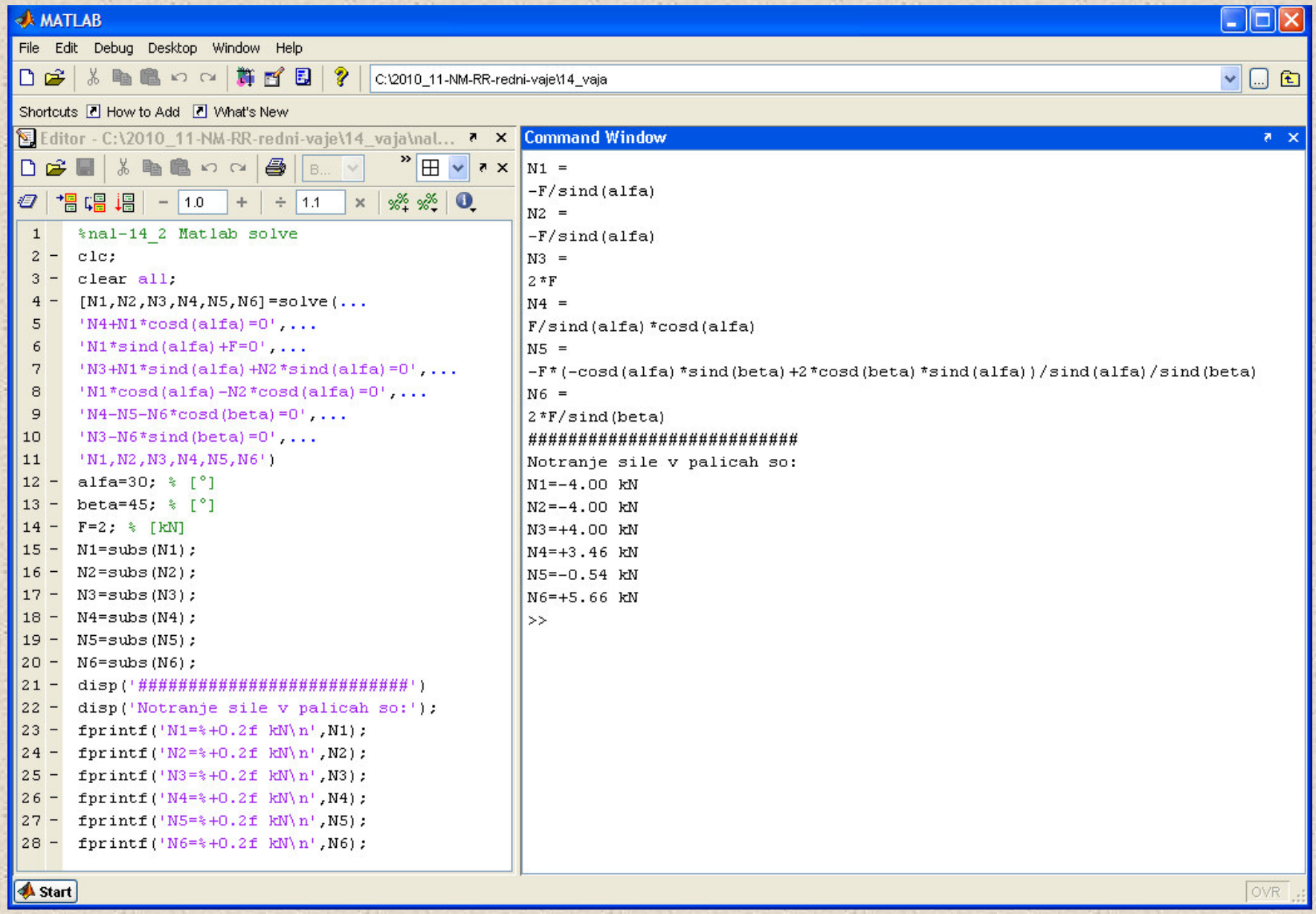
$$N_1 \cos(\alpha) - N_2 \cos(\alpha) = 0$$

$$N_4 - N_5 - N_6 \cos(\beta) = 0$$

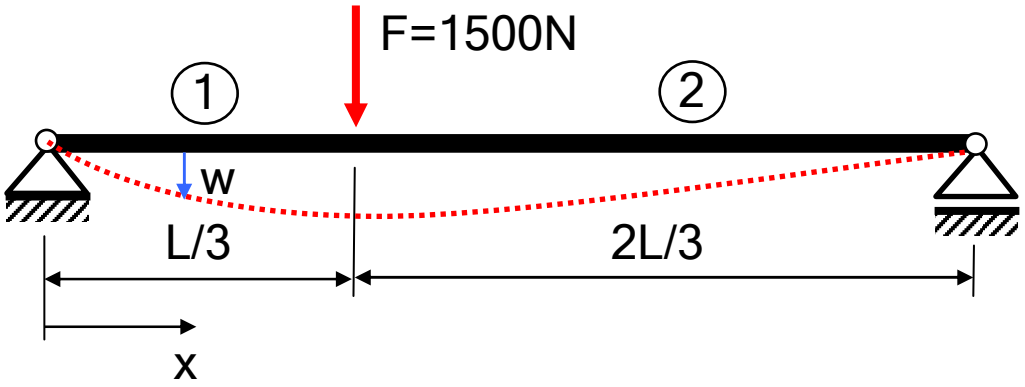
$$N_3 - N_6 \sin(\beta) = 0$$

$$N_i = ?,\ i = 1,..,6$$

14-3. naloga: izračunajte notranje sile N_i v palicah konstrukcije v odvisnosti od sile F



14-4. naloga: izračunajte in izrišite upogibnico w(x) za podani nosilec



L = 6000 mm

E = 2.10^5 MPa

J = 340.10^4 mm^4

a) Izračunajte upogibnico za 1. in 2. polje podanega nosilca za poljubno silo F, dolžino nosilca L, modul elastičnosti E in vztrajnostni moment prereza J . Uporabite Matlab-ovo funkcijo *dsolve* .

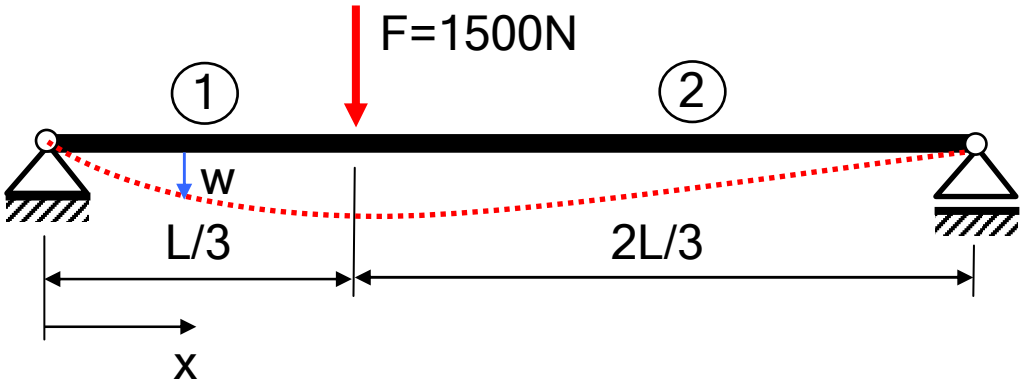
b) Za podane številčne podatke izrišite upogibnico in velikost zasuka v točkah vzdolž nosilca.

14-4. naloga: izračunajte in izrišite upogibnico w(x) za podani nosilec

L = 6000 mm

E = 2.10^5 MPa

J = 340.10^4 mm^4



diferencialna enačba za 1. polje:

$$\frac{d^2w_1}{dx^2} = -\frac{M_1(x)}{EJ} \quad , 0 \le x \le L/3$$

diferencialna enačba za 2. polje:

$$\frac{d^2w_2}{dx^2} = -\frac{M_2(x)}{EJ} \quad , L/3 \le x \le L$$

robni pogoji:

$$w_1(x=0) = 0$$

$$w_2(x=L) = 0$$

pogoji prehoda iz 1. v 2. polje:

$$w_1(x=L/3) = w_2(x=L/3)$$

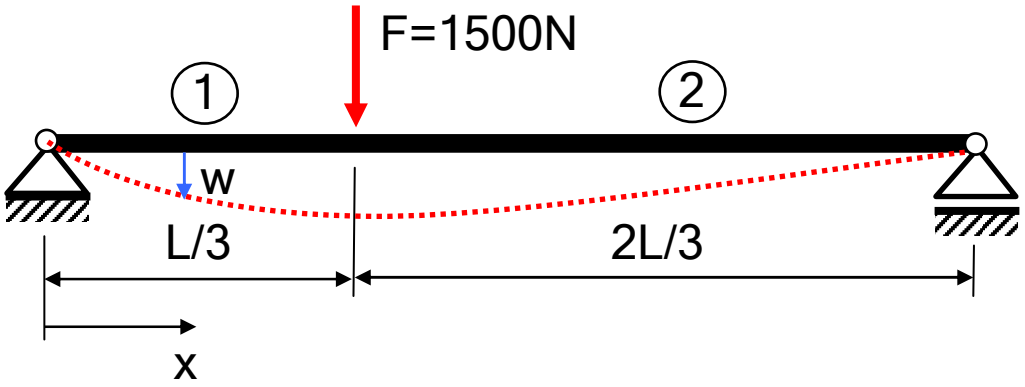
$$\frac{dw_1}{dx}(x=L/3) = \frac{dw_2}{dx}(x=L/3)$$

14-4. naloga: izračunajte in izrišite upogibnico w(x) za podani nosilec

L = 6000 mm

E = 2.10^5 MPa

J = 340.10^4 mm^4



notranji moment v 1. polju:

$$M_1(x) = \frac{2Fx}{3} \quad , 0 \le x \le L/3$$

notranji moment v 2. polju:

$$M_2(x) = \frac{F(L-x)}{3} \quad , L/3 \le x \le L$$

14-4. naloga: izračunajte in izrišite upogibnico w(x) za podani nosilec

MATLAB — Editor - C:\2010_11-NM-RR-redni-vaje\14_vaja\nal14_3.m

```matlab
%nal-14_3 Matlab dsolve
clc; clear all;
[w1,w2]=dsolve('D2w1=-2*F/3*x/(E*J)',...
'D2w2=-F*(L/3-x/3)/(E*J)',...
'w1(0)=0',...
'w1(L/3)=w2(L/3)','D1w1(L/3)=D1w2(L/3)',...
'w2(L)=0','x');
disp('w1='); pretty(simplify(w1))
disp('w2='); pretty(simplify(w2))
dw1=diff(w1);
dw2=diff(w2);
F=1.5e3; % [N]
E=2e5; % [N/mm2]
J=340e4; % [mm4]
L=6e3; % [mm]
xn=0:L/100:L;
for i=1:length(xn)
    x=xn(i);
    if x <= L/3
        wn(i)=subs(w1);
        dwn(i)=subs(dw1);
    else
        wn(i)=subs(w2);
        dwn(i)=subs(dw2);
    end
end
plot(xn,wn,'r',xn,10*atand(dwn),'k')
grid on
xlabel('x [mm]')
legend('poves [mm]','10*zasuk [°]')
```

Command Window

w1=

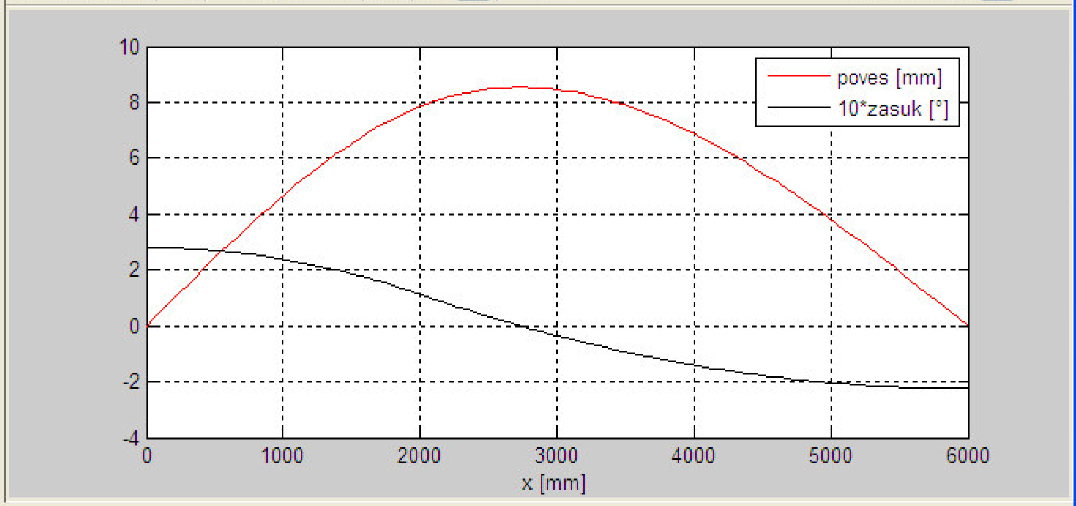
$$-1/81\,\frac{F\,x\,(9\,x^2-5\,L^2)}{E\,J}$$

w2=

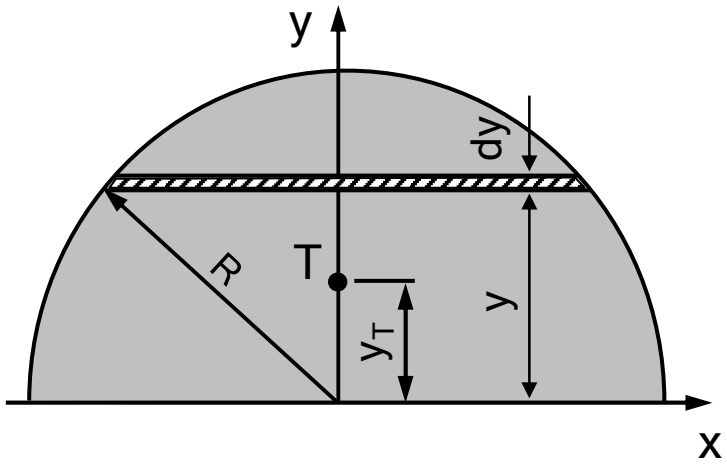
$$1/162\,\frac{F\,(-27\,L\,x^2+9\,x^3+19\,L^2\,x-L^3)}{E\,J}$$

>>

Figures - Figure 1



14-5. naloga: izračunajte formulo za določitev lege težišča polovice kroga



$$y_T = \frac{S_x}{A} = \frac{\int_0^R 2y\sqrt{R^2 - y^2}\,dy}{\int_0^R 2\sqrt{R^2 - y^2}\,dy}$$

Izračunajte formulo za določitev lege težišča polovice kroga za poljuben radij R . Uporabite Matlab-ovo funkcijo *int* .

14-5. naloga: izračunajte formulo za določitev lege težišča polovice kroga