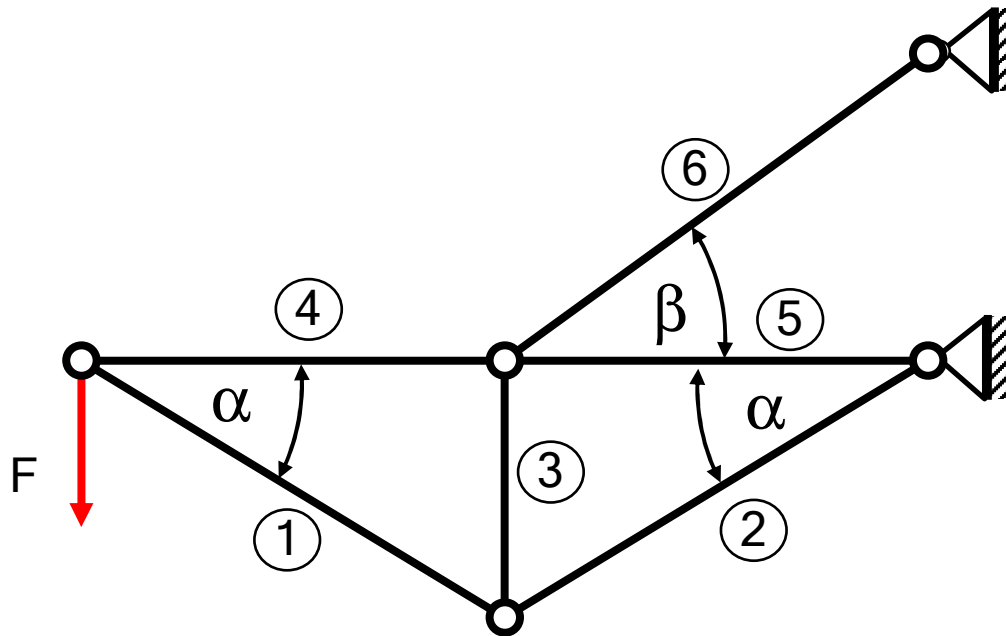
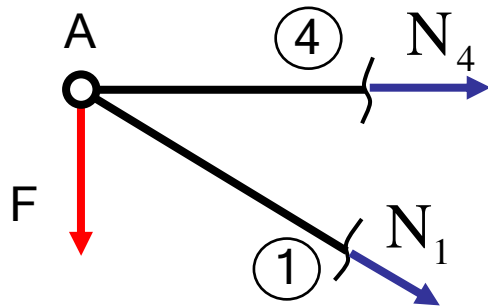


14-3. naloga: izračunajte notranje sile N_i v palicah konstrukcije v odvisnosti od sile F



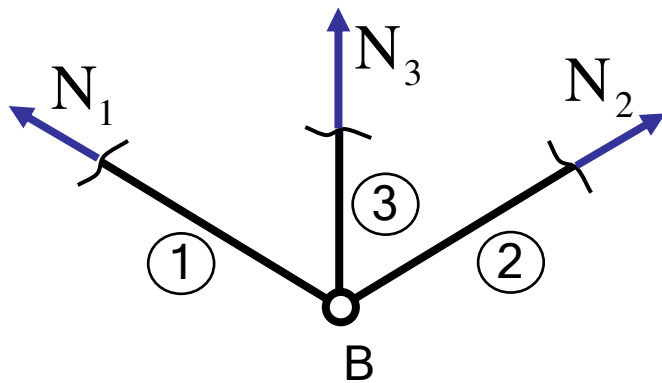
- Izračunajte notranje sile N_i v palicah v odvisnosti od sile F . Uporabite Matlab-ovo funkcijo *solve* .
- Za podano silo $F=2\text{kN}$, $\alpha=30^\circ$ in $\beta=45^\circ$ izračunajte notranje sile N_i .

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



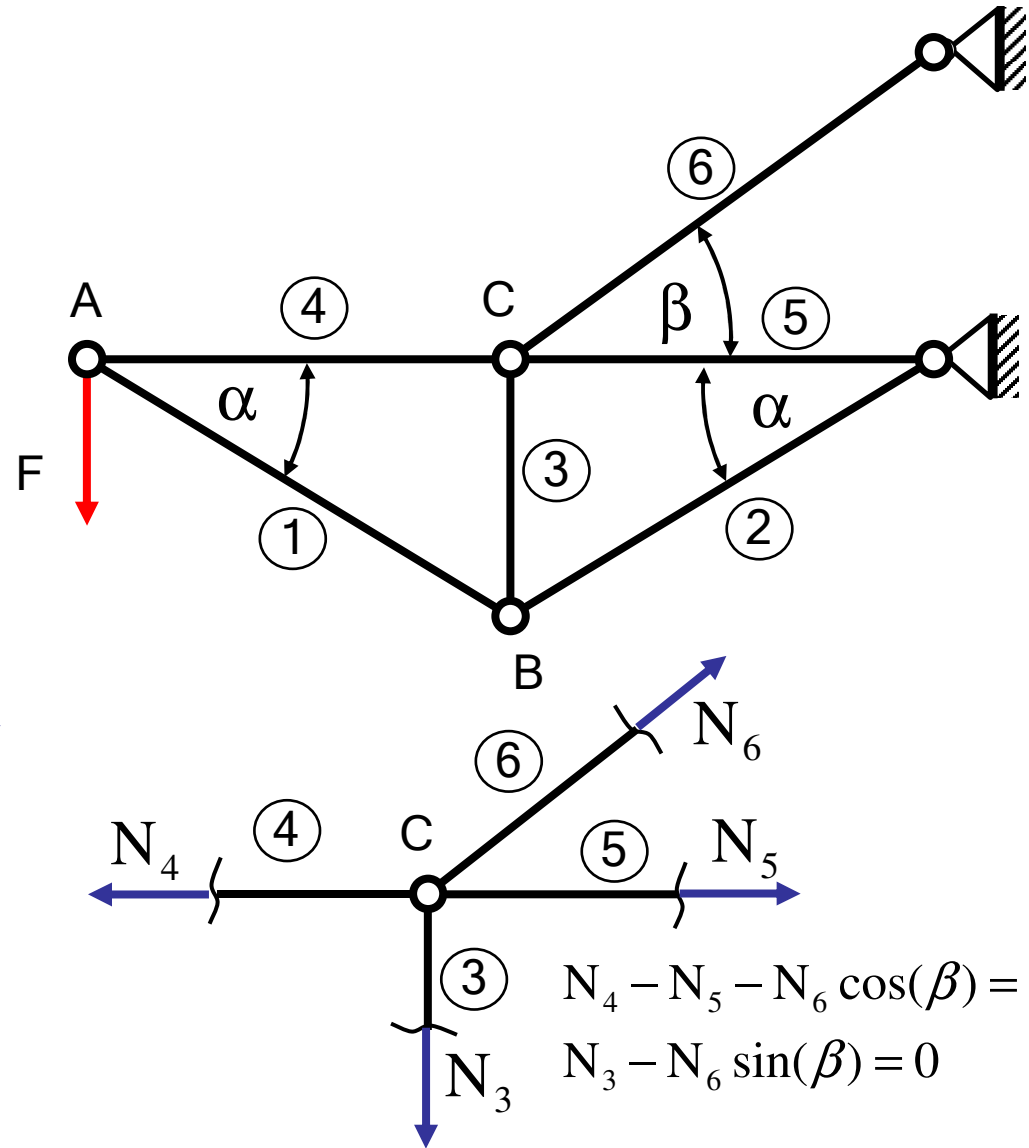
$$N_4 + N_1 \cos(\alpha) = 0$$

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



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

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



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

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

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

Sistem enačb:

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

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

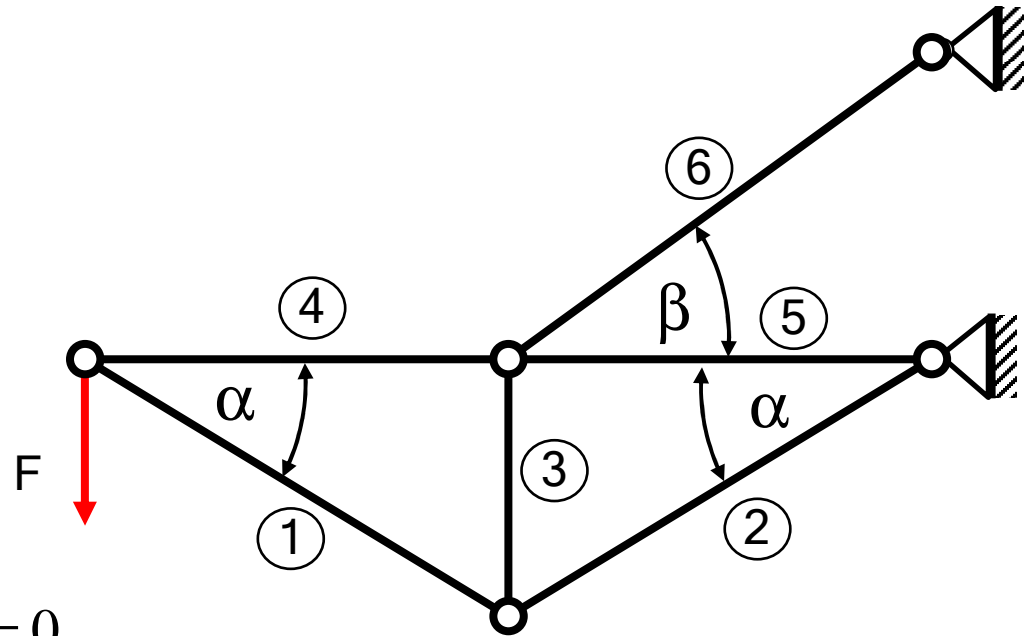
$$N_3 + N_1 \sin(\alpha) + N_2 \sin(\alpha) = 0$$

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

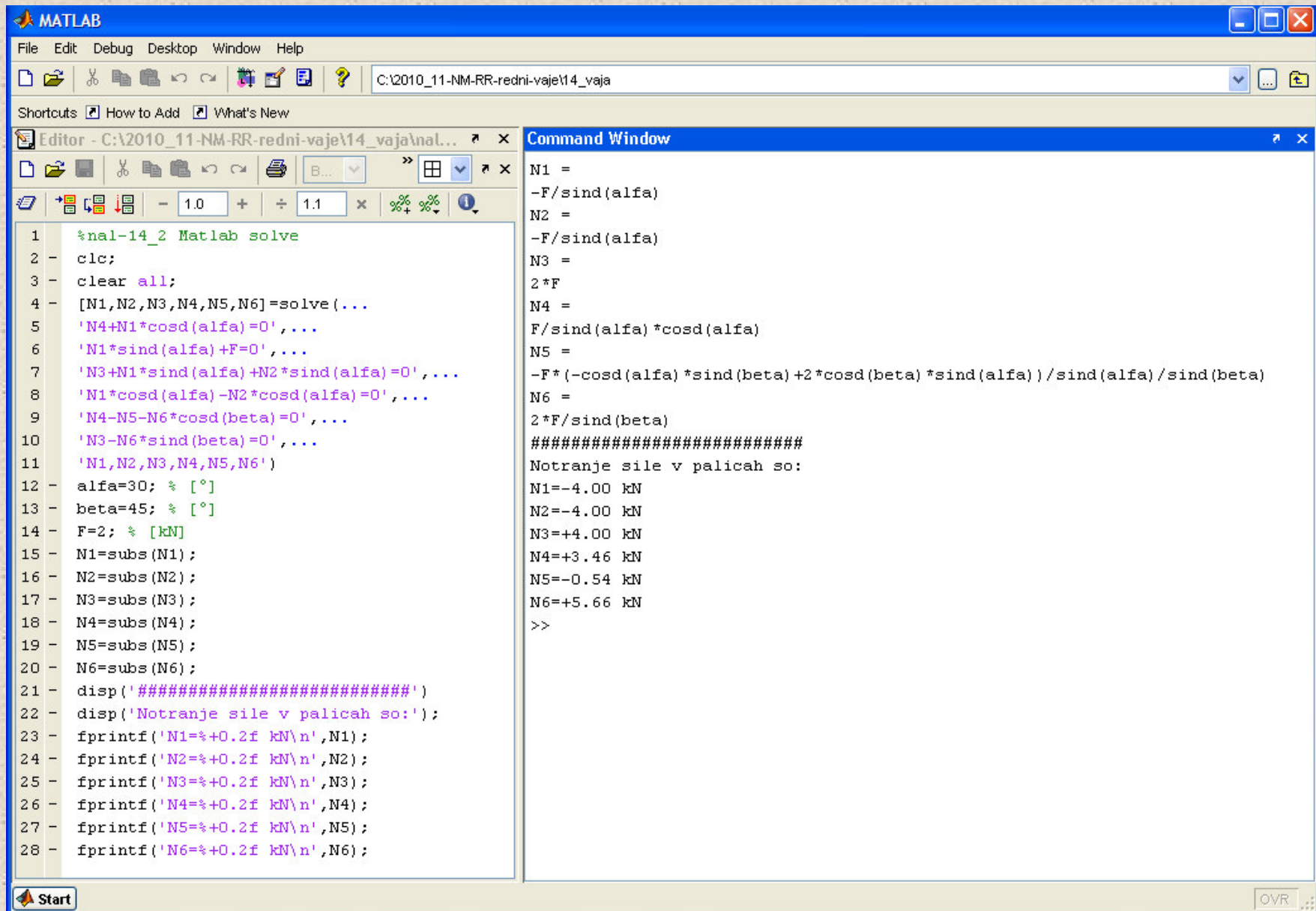
$$N_4 - N_5 - N_6 \cos(\beta) = 0$$

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

$$N_i = ?, \quad i = 1, \dots, 6$$



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

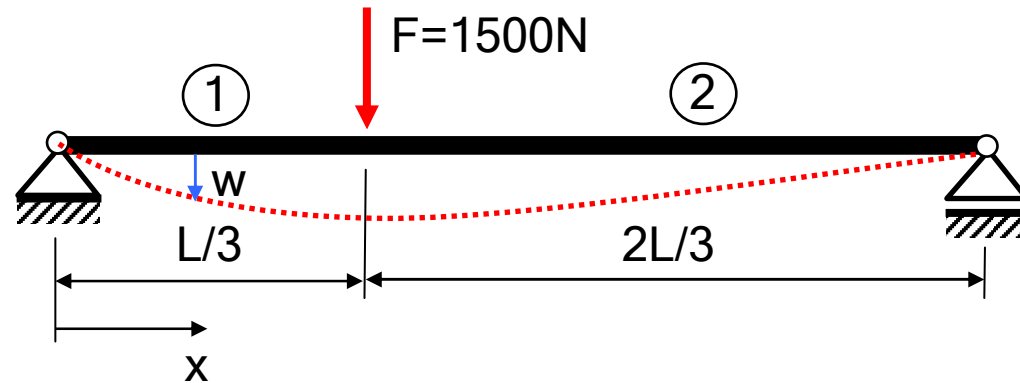


The image shows a MATLAB window with two panes: an Editor and a Command Window. The Editor pane contains MATLAB code for solving a system of equations to find internal forces in a truss. The Command Window shows the output of the code, including the values of the internal forces N_1 through N_6 .

```
1 %nal-14_2 Matlab solve
2 - clc;
3 - clear all;
4 - [N1,N2,N3,N4,N5,N6]=solve(...
5   'N4+N1*cosd(alfa)=0',...
6   'N1*sind(alfa)+F=0',...
7   'N3+N1*sind(alfa)+N2*sind(alfa)=0',...
8   'N1*cosd(alfa)-N2*cosd(alfa)=0',...
9   'N4-N5-N6*cosd(beta)=0',...
10  'N3-N6*sind(beta)=0',...
11  'N1,N2,N3,N4,N5,N6')
12 - alfa=30; % [°]
13 - beta=45; % [°]
14 - F=2; % [kN]
15 - N1=subs(N1);
16 - N2=subs(N2);
17 - N3=subs(N3);
18 - N4=subs(N4);
19 - N5=subs(N5);
20 - N6=subs(N6);
21 - disp('#####')
22 - disp('Notranje sile v palicah so:');
23 - fprintf('N1=%+0.2f kN\n',N1);
24 - fprintf('N2=%+0.2f kN\n',N2);
25 - fprintf('N3=%+0.2f kN\n',N3);
26 - fprintf('N4=%+0.2f kN\n',N4);
27 - fprintf('N5=%+0.2f kN\n',N5);
28 - fprintf('N6=%+0.2f kN\n',N6);
```

```
N1 =
-F/sind(alfa)
N2 =
-F/sind(alfa)
N3 =
2*F
N4 =
F/sind(alfa)*cosd(alfa)
N5 =
-F*(-cosd(alfa)*sind(beta)+2*cosd(beta)*sind(alfa))/sind(alfa)/sind(beta)
N6 =
2*F/sind(beta)
#####
Notranje sile v palicah so:
N1=-4.00 kN
N2=-4.00 kN
N3=+4.00 kN
N4=+3.46 kN
N5=-0.54 kN
N6=+5.66 kN
>>
```

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



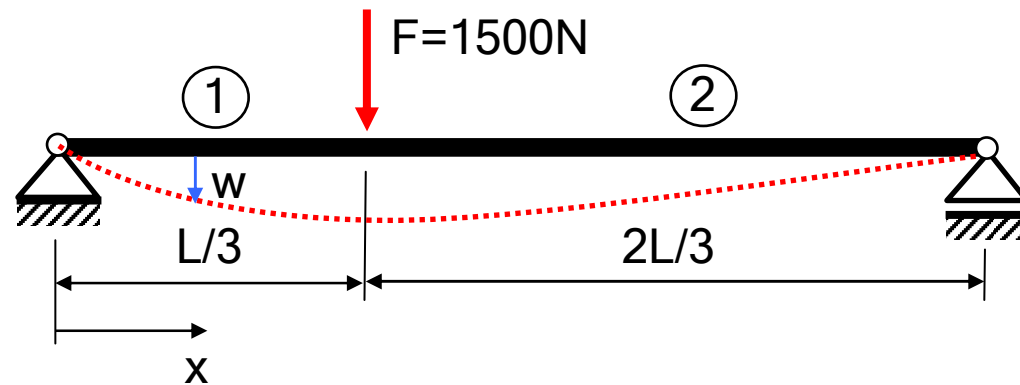
$$L = 6000 \text{ mm}$$

$$E = 2 \cdot 10^5 \text{ MPa}$$

$$J = 340 \cdot 10^4 \text{ mm}^4$$

- 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*.
- Za podane številčne podatke izrišite upogibnico in velikost zasukov v točkah vzdolž nosilca.

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



$$L = 6000 \text{ mm}$$

$$E = 2 \cdot 10^5 \text{ MPa}$$

$$J = 340 \cdot 10^4 \text{ mm}^4$$

diferencialna enačba za 1. polje:

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

diferencialna enačba za 2. polje:

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

robni pogoji:

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

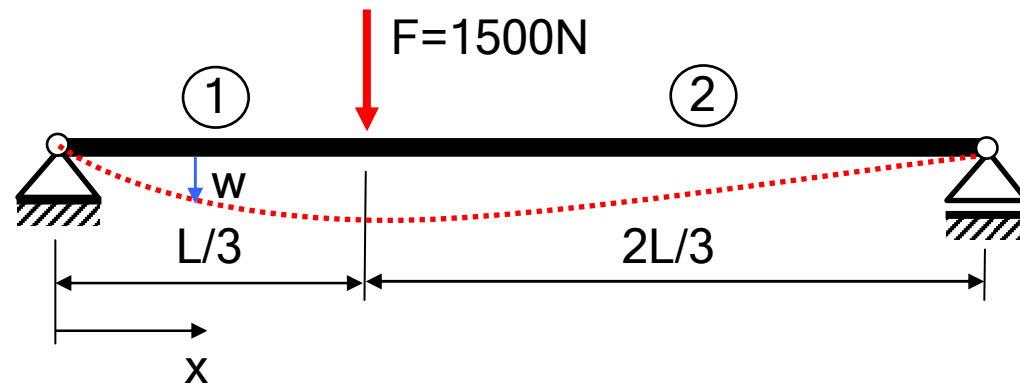
$$w_2(x=L) = 0$$

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



$$L = 6000 \text{ mm}$$

$$E = 2 \cdot 10^5 \text{ MPa}$$

$$J = 340 \cdot 10^4 \text{ mm}^4$$

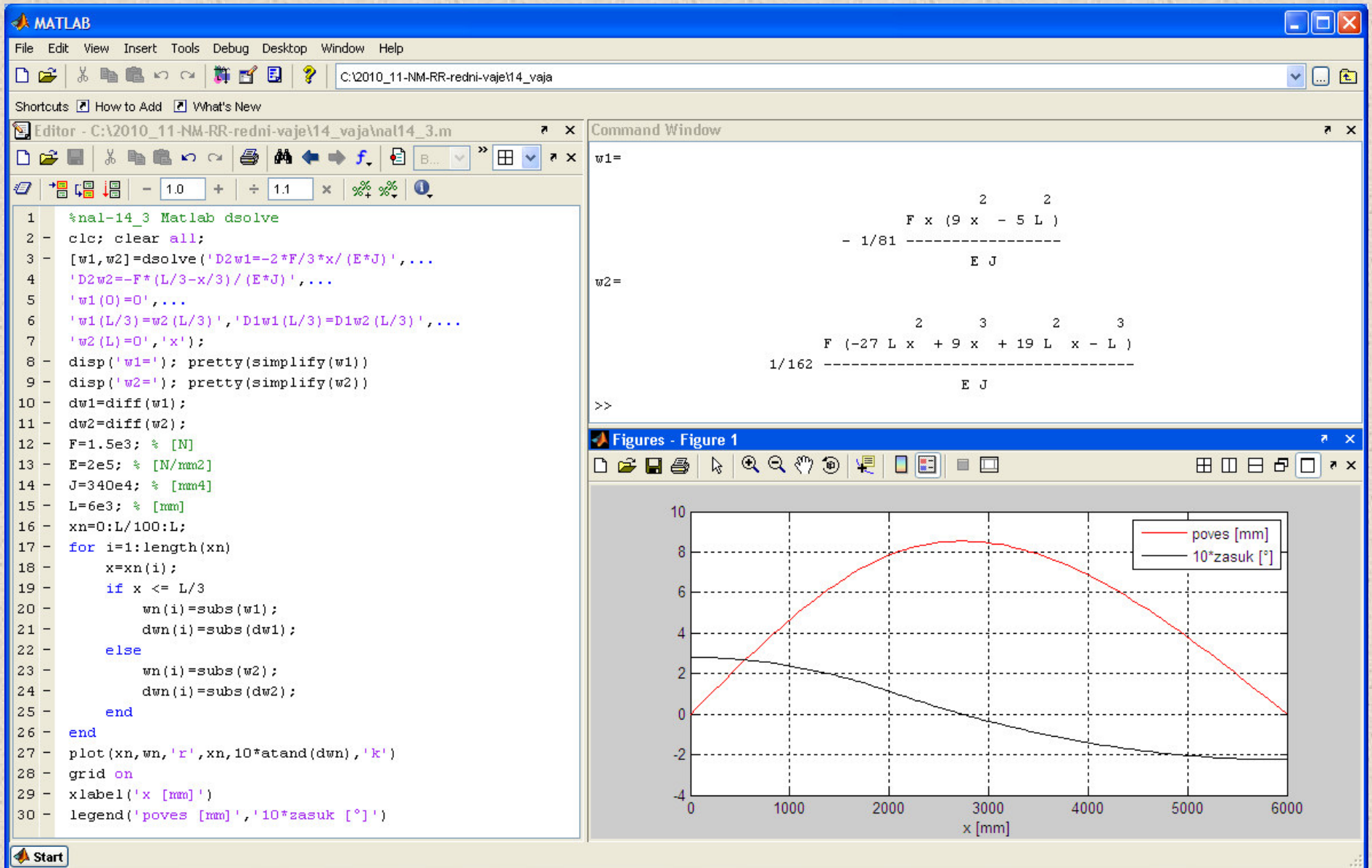
notranji moment v 1. polju:

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

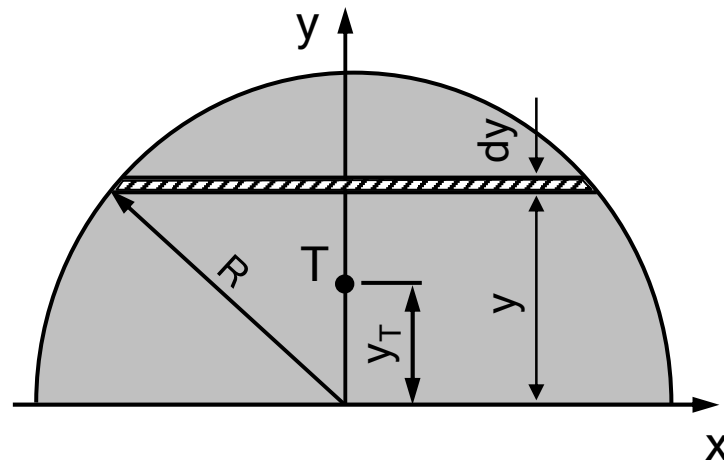
notranji moment v 2. polju:

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

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



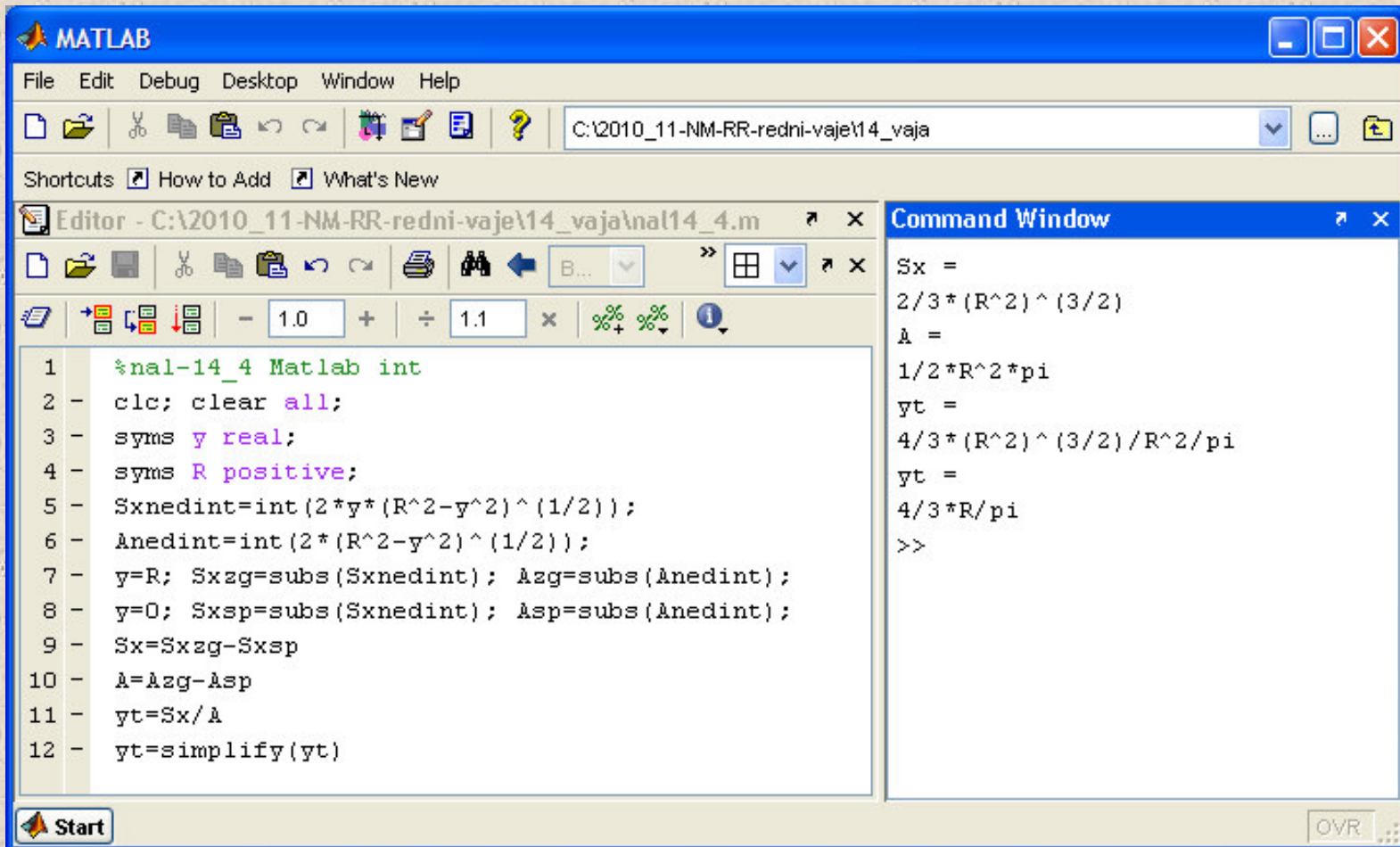
14-5. naloga: izračunajte formulo za določitev lege težišča polovice kroga



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

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



```
1 %nal-14_4 Matlab int
2 - clc; clear all;
3 - syms y real;
4 - syms R positive;
5 - Sxnedint=int(2*y*(R^2-y^2)^(1/2));
6 - Anedint=int(2*(R^2-y^2)^(1/2));
7 - y=R; Sxzg=subs(Sxnedint); Azg=subs(Anedint);
8 - y=0; Sxsp=subs(Sxnedint); Asp=subs(Anedint);
9 - Sx=Sxzg-Sxsp
10 - A=Azg-Asp
11 - yt=Sx/A
12 - yt=simplify(yt)
```

```
Sx =
2/3*(R^2)^(3/2)
A =
1/2*R^2*pi
yt =
4/3*(R^2)^(3/2)/R^2/pi
yt =
4/3*R/pi
>>
```