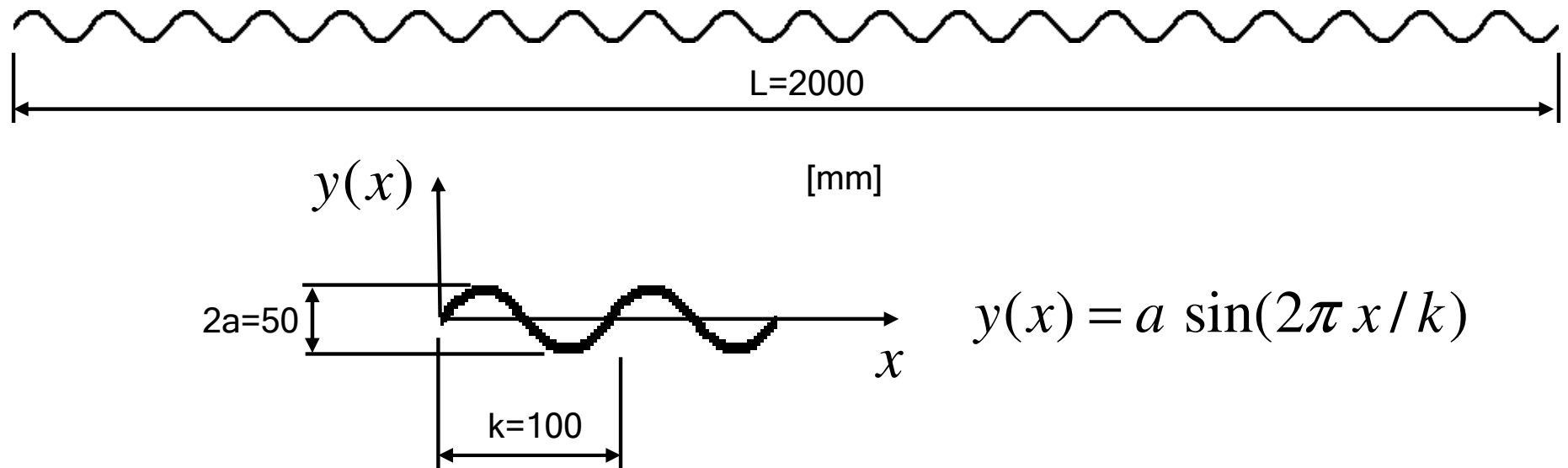


## 12-1. naloga: izračunajte potrebno dolžino pločevine za izdelavo strešne kritine

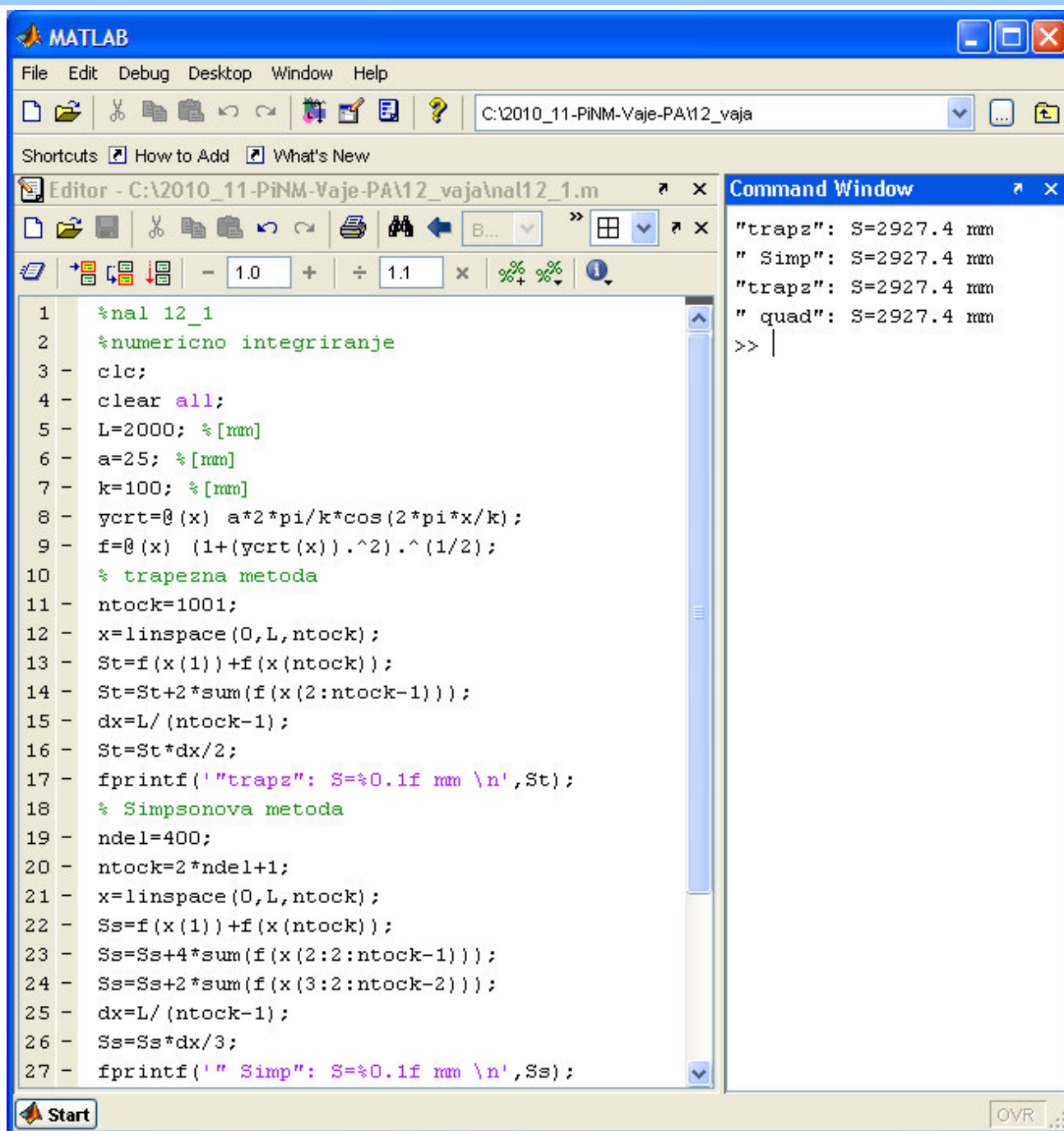


Izračun dolžine pločevine: 
$$S = \int_0^L \sqrt{1 + (y'(x))^2} dx$$

Za izračun integrala uporabite:

- 1) trapezno formulo
- 2) Simpsonovo formulo
- 3) Matlab-ovi funkciji *trapz* in *quad*

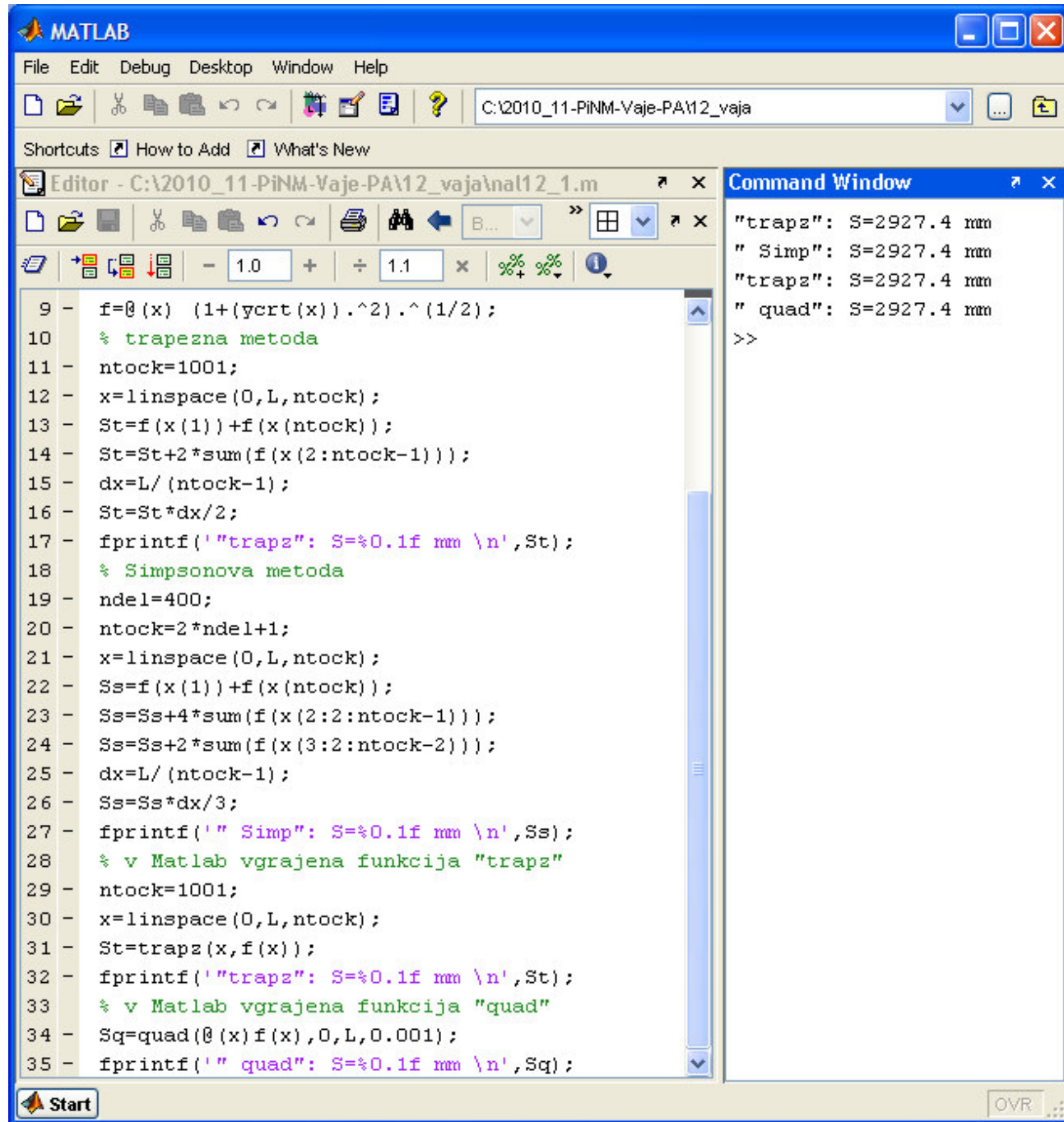
## 12-1. naloga: izračunajte potrebno dolžino pločevine za izdelavo strešne kritine



```
MATLAB
File Edit Debug Desktop Window Help
C:\2010_11-PiNM-Vaje-PA12_vaja
Shortcuts How to Add What's New
Editor - C:\2010_11-PiNM-Vaje-PA12_vaja\nal12_1.m
Command Window
"trapez": S=2927.4 mm
" Simpson": S=2927.4 mm
"trapez": S=2927.4 mm
"quad": S=2927.4 mm
>> |

1 %nal 12_1
2 %numericno integriranje
3 - clc;
4 - clear all;
5 - L=2000; % [mm]
6 - a=25; % [mm]
7 - k=100; % [mm]
8 - ycrt=@(x) a*2*pi/k*cos(2*pi*x/k);
9 - f=@(x) (1+(ycrt(x)).^2).^(1/2);
10 % trapezna metoda
11 - ntock=1001;
12 - x=linspace(0,L,ntock);
13 - St=f(x(1))+f(x(ntock));
14 - St=St+2*sum(f(x(2:ntock-1)));
15 - dx=L/(ntock-1);
16 - St=St*dx/2;
17 - fprintf('"trapez": S=%0.1f mm \n',St);
18 % Simpsonova metoda
19 - ndel=400;
20 - ntock=2*ndel+1;
21 - x=linspace(0,L,ntock);
22 - Ss=f(x(1))+f(x(ntock));
23 - Ss=Ss+4*sum(f(x(2:2:ntock-1)));
24 - Ss=Ss+2*sum(f(x(3:2:ntock-2)));
25 - dx=L/(ntock-1);
26 - Ss=Ss*dx/3;
27 - fprintf('" Simpson": S=%0.1f mm \n',Ss);
```

## 12-1. naloga: izračunajte potrebno dolžino pločevine za izdelavo strešne kritine



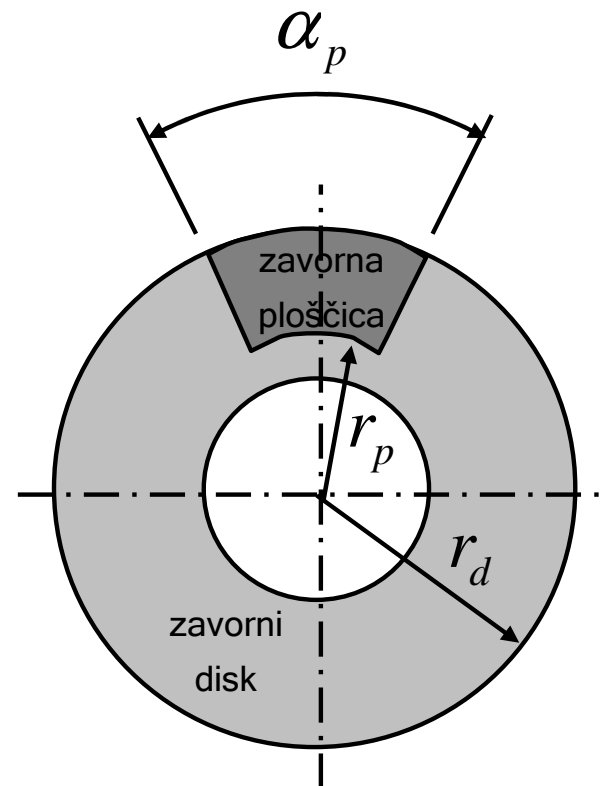
```
MATLAB
File Edit Debug Desktop Window Help
C:\2010_11-PiNM-Vaje-PA12_vaja
Shortcuts How to Add What's New
Editor - C:\2010_11-PiNM-Vaje-PA12_vaja\nal12_1.m
Command Window
"trapez": S=2927.4 mm
" Simpson": S=2927.4 mm
"trapez": S=2927.4 mm
"quad": S=2927.4 mm
>>

9 - f=@(x) (1+(sqrt(x)).^2).^(1/2);
10 % trapezna metoda
11 - ntock=1001;
12 - x=linspace(0,L,ntock);
13 - St=f(x(1))+f(x(ntock));
14 - St=St+2*sum(f(x(2:ntock-1)));
15 - dx=L/(ntock-1);
16 - St=St*dx/2;
17 - fprintf('"trapez": S=%0.1f mm \n',St);
18 % Simpsonova metoda
19 - ndel=400;
20 - ntock=2*ndel+1;
21 - x=linspace(0,L,ntock);
22 - Ss=f(x(1))+f(x(ntock));
23 - Ss=Ss+4*sum(f(x(2:2:ntock-1)));
24 - Ss=Ss+2*sum(f(x(3:2:ntock-2)));
25 - dx=L/(ntock-1);
26 - Ss=Ss*dx/3;
27 - fprintf('" Simpson": S=%0.1f mm \n',Ss);
28 % v Matlab vgrajena funkcija "trapez"
29 - ntock=1001;
30 - x=linspace(0,L,ntock);
31 - St=trapez(x,f(x));
32 - fprintf('"trapez": S=%0.1f mm \n',St);
33 % v Matlab vgrajena funkcija "quad"
34 - Sq=quad(@f(x),0,L,0.001);
35 - fprintf('"quad": S=%0.1f mm \n',Sq);
```

## 12-2. naloga: izračunajte povprečno temperaturo zavorne ploščice

Izračun povprečne temperature:

$$\bar{T} = \frac{\hat{\alpha}_p \int_{r_p}^{r_d} T(r) r dr}{\hat{\alpha}_p (r_d^2 - r_p^2) / 2}$$



$$\alpha_p = 40^\circ$$

$$r_d = 150\text{mm}$$

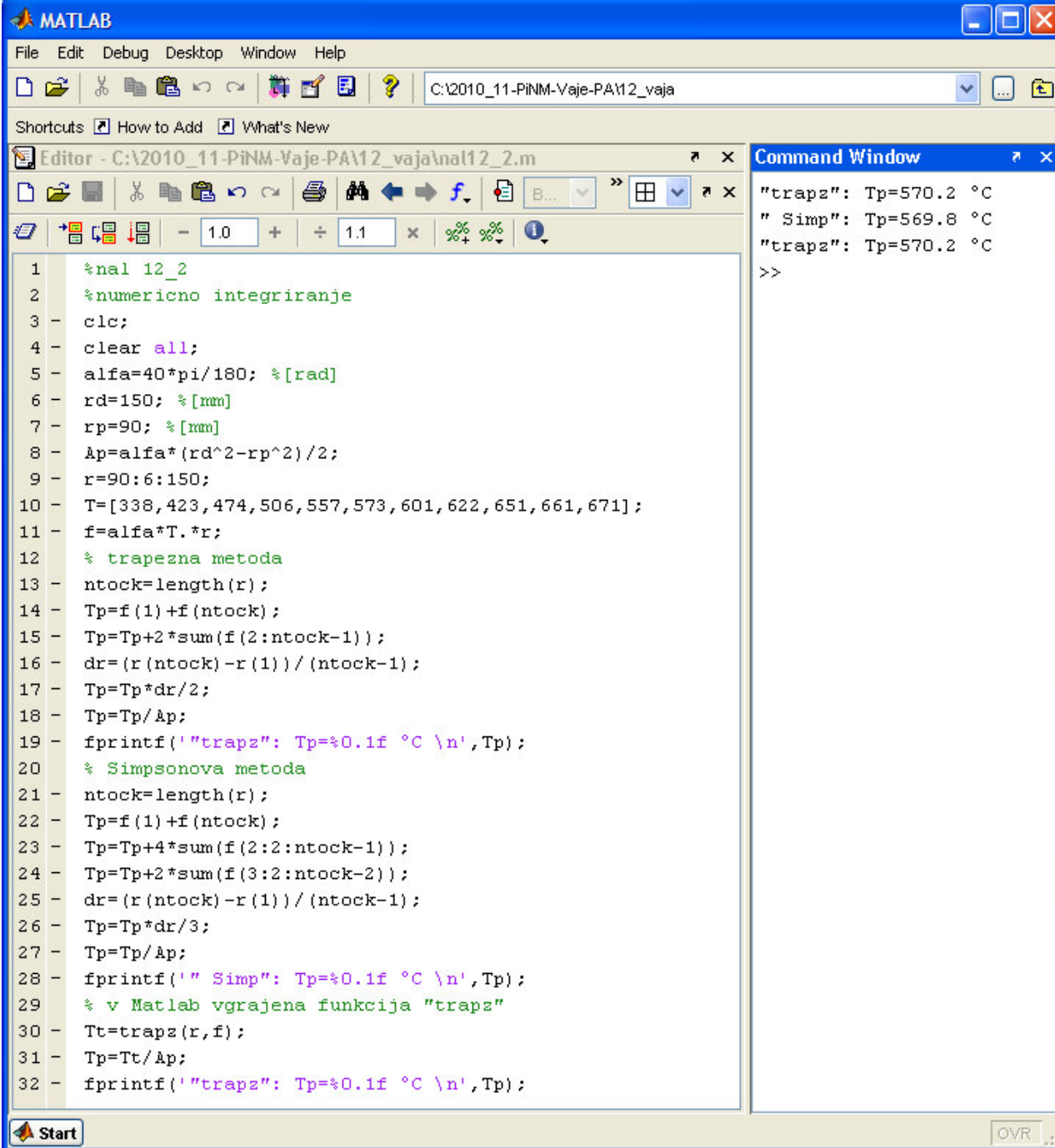
$$r_p = 90\text{mm}$$

r [mm]	T [°C]
90	338
96	423
102	474
108	506
114	557
120	573
126	601
132	622
138	651
144	661
150	671

Za izračun integrala uporabite:

- 1) trapezno formulo
- 2) Simpsonovo formulo
- 3) Matlab-ovo funkcijo *trapz*

## 12-2. naloga: izračunajte povprečno temperaturo zavorne ploščice



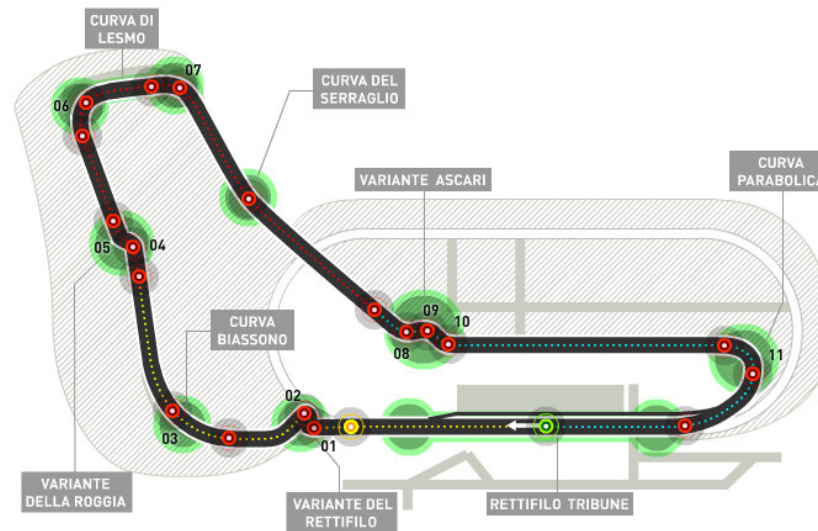
The image shows a MATLAB window with a script editor and a command window. The script editor contains the following code:

```
1 %nal 12_2
2 %numericno integriranje
3 - clc;
4 - clear all;
5 - alfa=40*pi/180; %[rad]
6 - rd=150; %[mm]
7 - rp=90; %[mm]
8 - Ap=alfa*(rd^2-rp^2)/2;
9 - r=90:6:150;
10 - T=[338,423,474,506,557,573,601,622,651,661,671];
11 - f=alfa*T.*r;
12 % trapezna metoda
13 - ntock=length(r);
14 - Tp=f(1)+f(ntock);
15 - Tp=Tp+2*sum(f(2:ntock-1));
16 - dr=(r(ntock)-r(1))/(ntock-1);
17 - Tp=Tp*dr/2;
18 - Tp=Tp/Ap;
19 - fprintf('"trapez": Tp=%0.1f °C \n',Tp);
20 % Simpsonova metoda
21 - ntock=length(r);
22 - Tp=f(1)+f(ntock);
23 - Tp=Tp+4*sum(f(2:2:ntock-1));
24 - Tp=Tp+2*sum(f(3:2:ntock-2));
25 - dr=(r(ntock)-r(1))/(ntock-1);
26 - Tp=Tp*dr/3;
27 - Tp=Tp/Ap;
28 - fprintf('" Simp": Tp=%0.1f °C \n',Tp);
29 % v Matlab vgrajena funkcija "trapez"
30 - Tt=trapez(r,f);
31 - Tp=Tt/Ap;
32 - fprintf('"trapez": Tp=%0.1f °C \n',Tp);
```

The Command Window shows the output of the script:

```
"trapez": Tp=570.2 °C
" Simp": Tp=569.8 °C
"trapez": Tp=570.2 °C
>>
```

12-3. naloga: izračunajte dolžino ceste na dirkališču, če je podana v enakih časovnih intervalih hitrost vozila za en krog



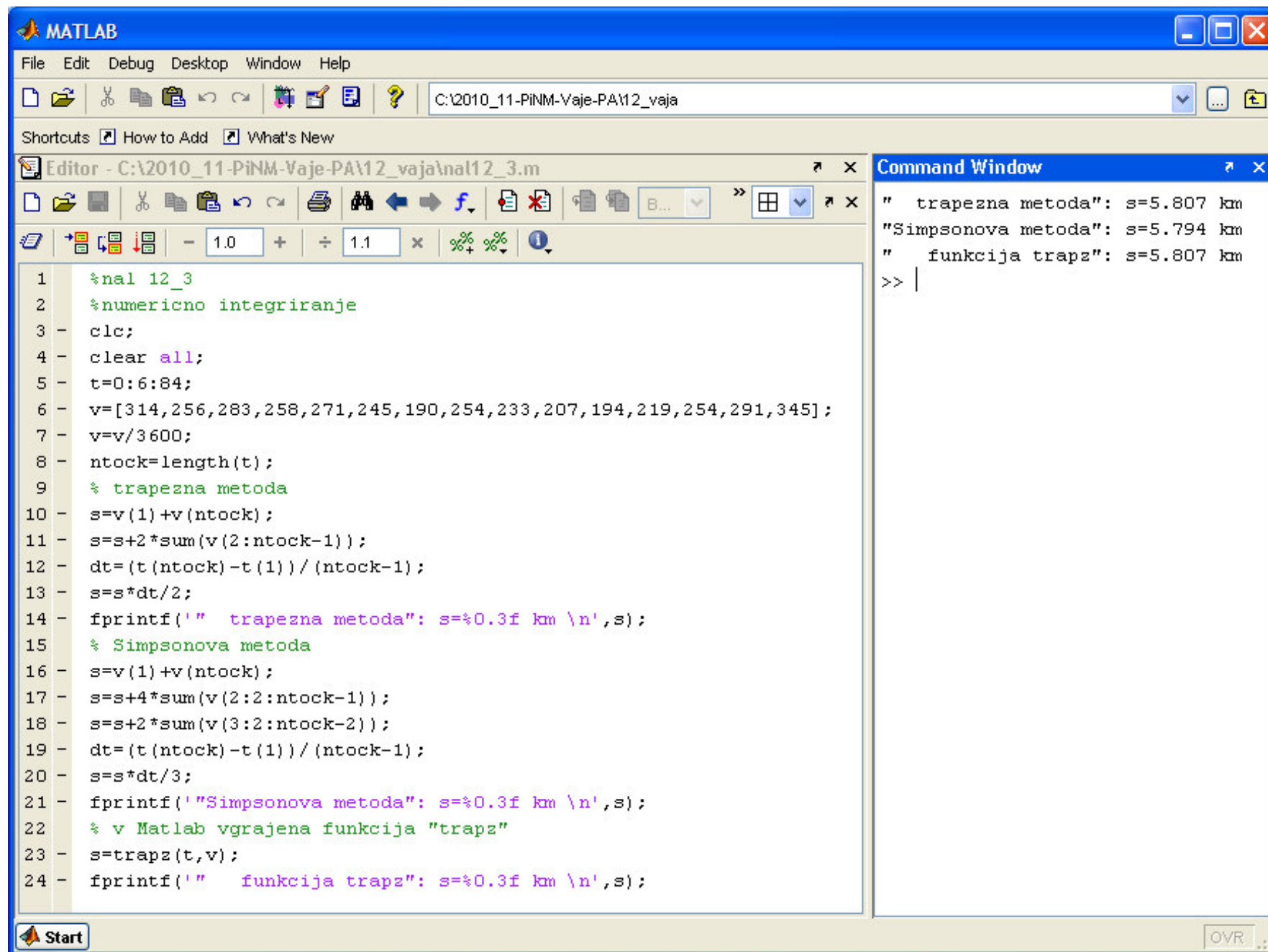
t [s]	v [km/h]
0	314
6	256
12	283
18	258
24	271
30	245
36	190
42	254
48	233
54	207
60	194
66	219
72	254
78	291
84	345

Izračun dolžine:  $s = \int_0^{t=84s} v(t) dt$

Za izračun integrala uporabite:

- 1) trapezno formulo
- 2) Simpsonovo formulo
- 3) Matlab-ovo funkcijo *trapz*

## 12-3. naloga: izračunajte dolžino ceste na dirkališču



```
MATLAB
File Edit Debug Desktop Window Help
C:\2010_11-PiNM-Vaje-PA\12_vaja
Shortcuts How to Add What's New
Editor - C:\2010_11-PiNM-Vaje-PA\12_vaja\nal12_3.m
Command Window
" trapezna metoda": s=5.807 km
"Simpsonova metoda": s=5.794 km
" funkcija trapz": s=5.807 km
>> |

1 %nal 12_3
2 %numericno integriranje
3 - clc;
4 - clear all;
5 - t=0:6:84;
6 - v=[314,256,283,258,271,245,190,254,233,207,194,219,254,291,345];
7 - v=v/3600;
8 - ntock=length(t);
9 % trapezna metoda
10 - s=v(1)+v(ntock);
11 - s=s+2*sum(v(2:ntock-1));
12 - dt=(t(ntock)-t(1))/(ntock-1);
13 - s=s*dt/2;
14 - fprintf(" trapezna metoda": s=%0.3f km \n',s);
15 % Simpsonova metoda
16 - s=v(1)+v(ntock);
17 - s=s+4*sum(v(2:2:ntock-1));
18 - s=s+2*sum(v(3:2:ntock-2));
19 - dt=(t(ntock)-t(1))/(ntock-1);
20 - s=s*dt/3;
21 - fprintf("Simpsonova metoda": s=%0.3f km \n',s);
22 % v Matlab vgrajena funkcija "trapz"
23 - s=trapz(t,v);
24 - fprintf(" funkcija trapz": s=%0.3f km \n',s);
```