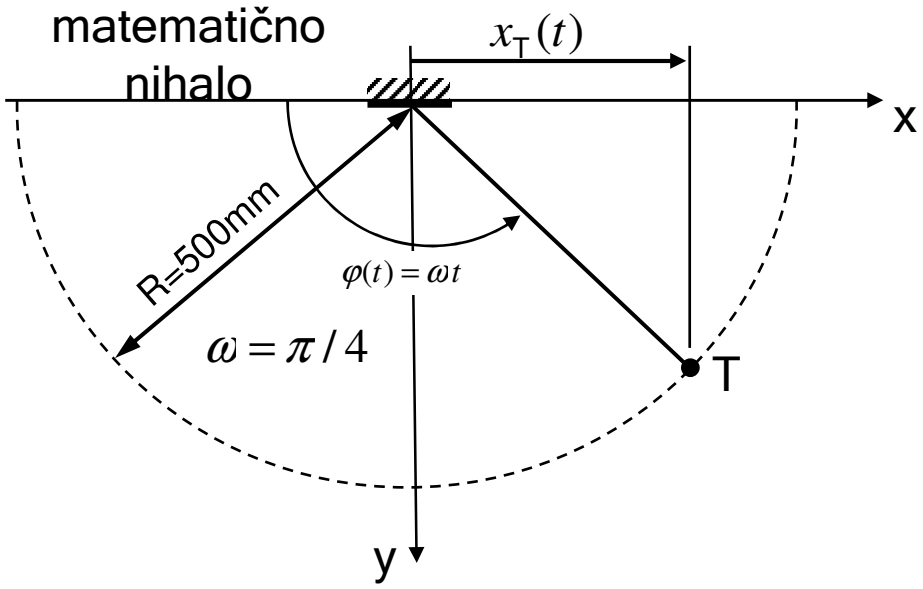
13-1. naloga: izračunajte hitrost in pospešek točke T v smeri x koordinatne osi

$$x_T(t) = R\sin(\omega t - \pi/2)$$

$$v_T(t) = \frac{dx(t)}{dt} = \omega R\cos(\omega t - \pi/2)$$

$$a_T(t) = \frac{dv(t)}{dt} = -\omega^2 R\sin(\omega t - \pi/2)$$



Za izračun hitrosti in pospeška točke T uporabite Matlab-ovi funkciji *diff* in *gradient*.

13-1. naloga: izračunajte hitrost in pospešek točke T v smeri x koordinatne osi

MATLAB

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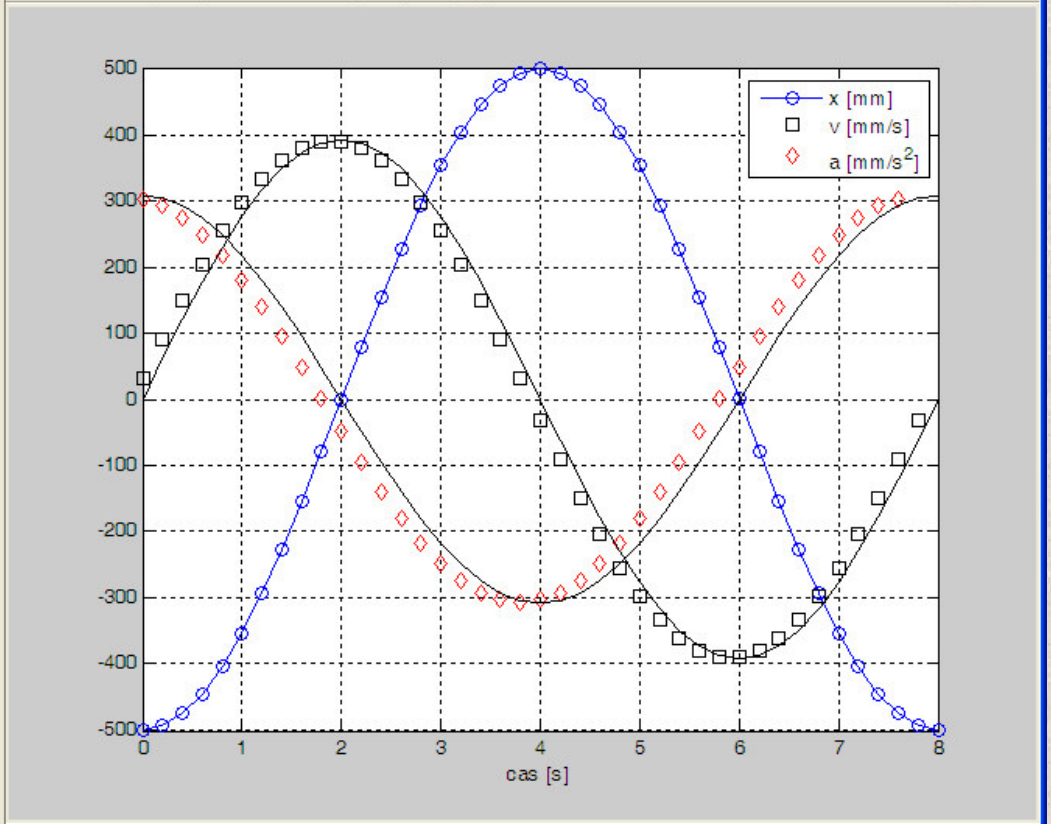
C:\Documents and Settings\Mole\A-HOME\Biro\AA-Predavanja-Vaje\NM\2011_12-NM-RR\13_vaja

Shortcuts How to Add What's New

Editor - C:\Documents and Settings\Mole\A-HOME\Biro\AA-Predavanj...

```
1   % nal-13_1
2   % odvajanje - uporaba Matlab-ove funkcije "diff"
3 - clc; clear all;
4 - hold off;
5 - R=500; %[mm]
6 - omega=pi/4; %[rad/s]
7 - fx=@(t,R,omega) R*sin(omega*t-pi/2);
8 - fve=@(t,R,omega) R*omega*cos(omega*t-pi/2);
9 - fae=@(t,R,omega) -R*omega^2*sin(omega*t-pi/2);
10 - tz=0; %[s]
11 - tk=8; %[s]
12 - dt=0.2; %[s]
13 - t=tz:dt:tk;
14 - x=fx(t,R,omega); %[mm]
15 - nx=length(x);
16 - plot(t,x,'-ob'); legend('x [mm]');
17 - xlabel('cas [s]'); grid on; ylim([-502,502]);
18 - v=diff(x)/dt; %[mm/s]
19 - nv=length(v);
20 - tv=tz:dt:tk-dt;
21 - hold on;
22 - plot(tv,v,'sk'); legend('x [mm]','v [mm/s]');
23 - a=diff(v)/dt; %[mm/s]
24 - na=length(a);
25 - ta=tz:dt:tk-2*dt;
26 - plot(ta,a,'dr');
27 - legend('x [mm]','v [mm/s]','a [mm/s^2]');
28 - ve=fve(t,R,omega); %[mm/s]
29 - ae=fae(t,R,omega); %[mm/s2]
30 - plot(t,ve,'k',t,ae,'k');
```

Figures - Figure 1



Command Window

>>

Start

13-1. naloga: izračunajte hitrost in pospešek točke T v smeri x koordinatne osi

MATLAB

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Shortcuts How to Add What's New

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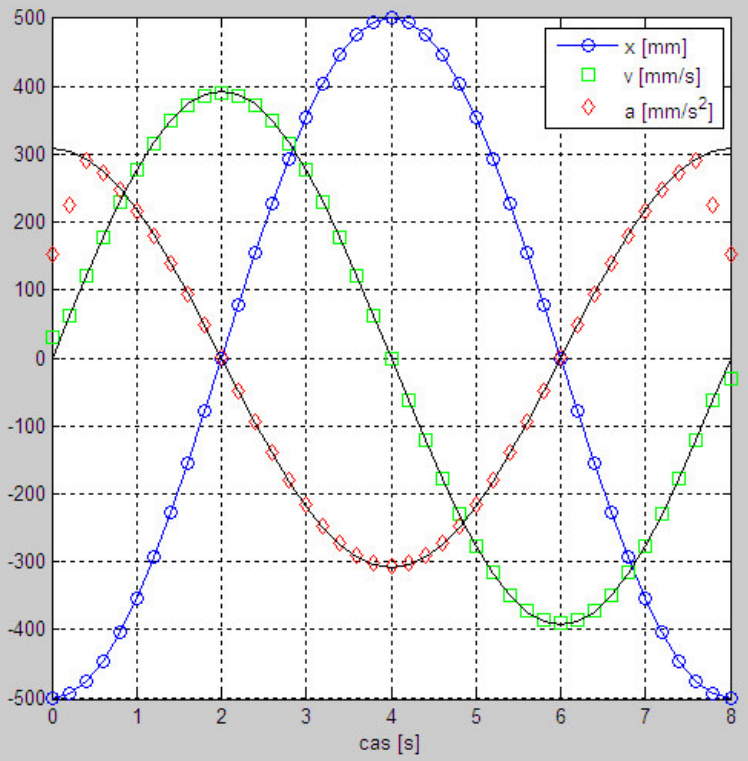
```
%nal-13_2
%odvajanje - uporaba Matlab-ove funkcije "gradient"
clc; clear all;
hold off;
R=500; %[mm]
omega=pi/4; %[rad/s]
fx=@(t,R,omega) R*sin(omega*t-pi/2);
fve=@(t,R,omega) R*omega*cos(omega*t-pi/2);
fae=@(t,R,omega) -R*omega^2*sin(omega*t-pi/2);
tz=0; %[s]
tk=8; %[s]
dt=0.2; %[s]
t=tz:dt:tk;
x=fx(t,R,omega); %[mm]
nx=length(x);
plot(t,x,'-ob');
xlabel('cas [s]'); grid on; ylim([-502,502]);
legend('x [mm]');
v=gradient(x,dt); %[mm/s]
nv=length(v);
hold on;
plot(t,v,'sg');
legend('x [mm]','v [mm/s]');
a=gradient(v,dt); %[mm/s]
na=length(a);
plot(t,a,'dr');
legend('x [mm]','v [mm/s]','a [mm/s^2]');
ve=fve(t,R,omega); %[mm/s]
ae=fae(t,R,omega); %[mm/s2]
plot(t,ve,'k',t,ae,'k');
```

Figures - Figure 1



Command Window

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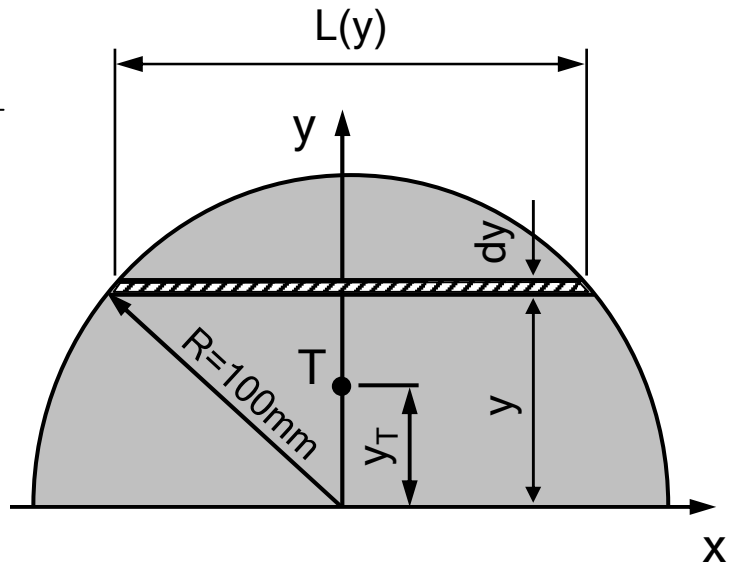
Start

13-2. naloga: izračunajte lego težišča polovice kroga

$$y_T = \frac{S_x}{A} = \frac{\int_A y\,dA}{\int_A dA} = \frac{\int_0^R y\,L(y)\,dy}{\int_0^R L(y)\,dy} = \frac{\int_0^R y\,2\sqrt{R^2 - y^2}\,dy}{\int_0^R 2\sqrt{R^2 - y^2}\,dy}$$

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



Za izračun integralov uporabite:

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

13-2. naloga: izračunajte lego težišča polovice kroga

MATLAB

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Shortcuts How to Add What's New

Editor - C:\2010_11-NM-RR-redni-vaje\13_vaja\nal13_3.m

```
1  %nal-13_3
2  %numericno integriranje - trapezna metoda
3  clc; clear all;
4  R=100; %[mm]
5  ysp=0; yzg=R;
6  yte=4*R/(3*pi);
7  fA=@(y,R) (R^2-y^2)^(1/2);
8  ndel=1;
9  As=0; Ss=0; yts=0; ytizbs=0;
10 ods2=1.e99;
11 disp('ntock     yt[mm]  ods[%] ytizb[mm]  ods[%]');
12 while ods2 > 0.01 %
13     A=0; S=0;
14     ndel=ndel*2;
15     y=linspace(ysp,yzg,ndel+1);
16     A=fA(y(1),R)+fA(y(end),R);
17     S=y(1)*fA(y(1),R)+y(end)*fA(y(end),R);
18     for i=2:ndel
19         A=A+2*fA(y(i),R);
20         S=S+2*y(i)*fA(y(i),R);
21     end
22     dy=(yzg-ysp)/ndel;
23     A=A*dy/2; S=S*dy/2;
24     Aizb=(4*A-As)/3; Sizb=(4*S-Ss)/3;
25     yt=S/A; ytizb=Sizb/Aizb;
26     ods1=abs(yt-yts)/yt*100; ods2=abs(ytizb-ytizbs)/ytizb*100; % [%]
27     fprintf('%5i  %9.2f %7.2f %9.2f %7.2f \n',ndel+1,yt,ods1,ytizb,ods2);
28     As=A; Ss=S;
29     yts=yt; ytizbs=ytizb;
30 end
31 fprintf('\nAnaliticno izracunana lega tezisca je %0.2f mm.\n',yte);
```

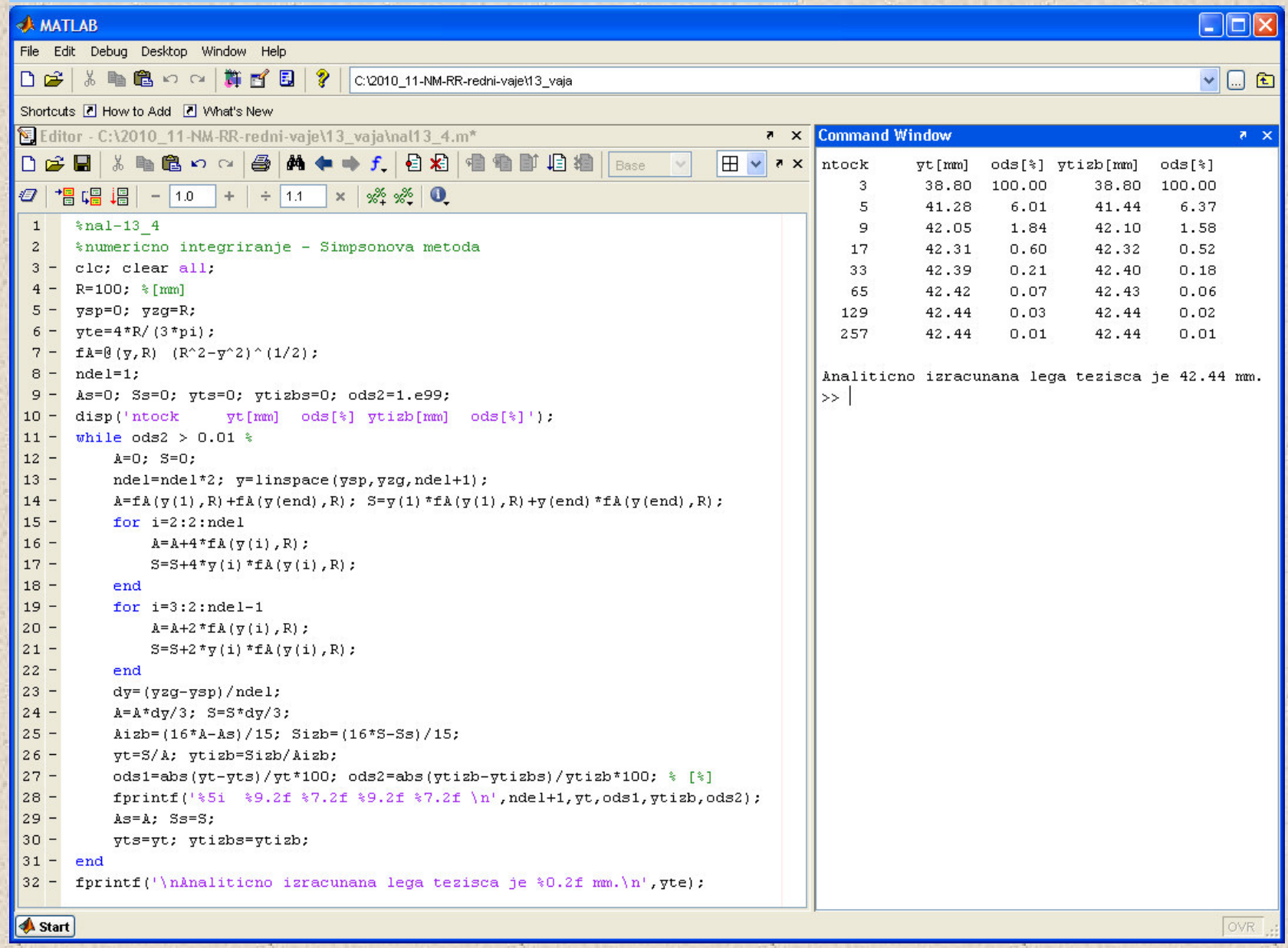
Command Window

```
ntock      yt[mm]   ods[%] ytizb[mm]   ods[%]
    3       31.70   100.00      31.70   100.00
    5       39.09    18.92      41.28    23.21
    9       41.33     5.42      42.05     1.84
   17       42.07     1.74      42.31     0.60
   33       42.31     0.58      42.39     0.21
   65       42.40     0.20      42.42     0.07
  129       42.43     0.07      42.44     0.03
  257       42.44     0.02      42.44     0.01

Analiticno izracunana lega tezisca je 42.44 mm.
>>
```

Start OVR

13-2. naloga: izračunajte lego težišča polovice kroga



13-2. naloga: izračunajte lego težišča polovice kroga