	Curso	**Métodos Numéricos**
	Tema	**Ecuaciones Diferenciales Ordinarias**
	Laboratorio	
	Profesor	**Pantoja Carhuavilca, Hermes**

1. **Utilizando el método de Euler, Taylor, Runge Kutta de orden 2 y 4, desarrollar**

$$\textbf{a}\;\; y' = te^{3t} - 2y, \quad 0 \le t \le 1, \quad y(0) = -0.08, \text{ com } h = 0.25$$

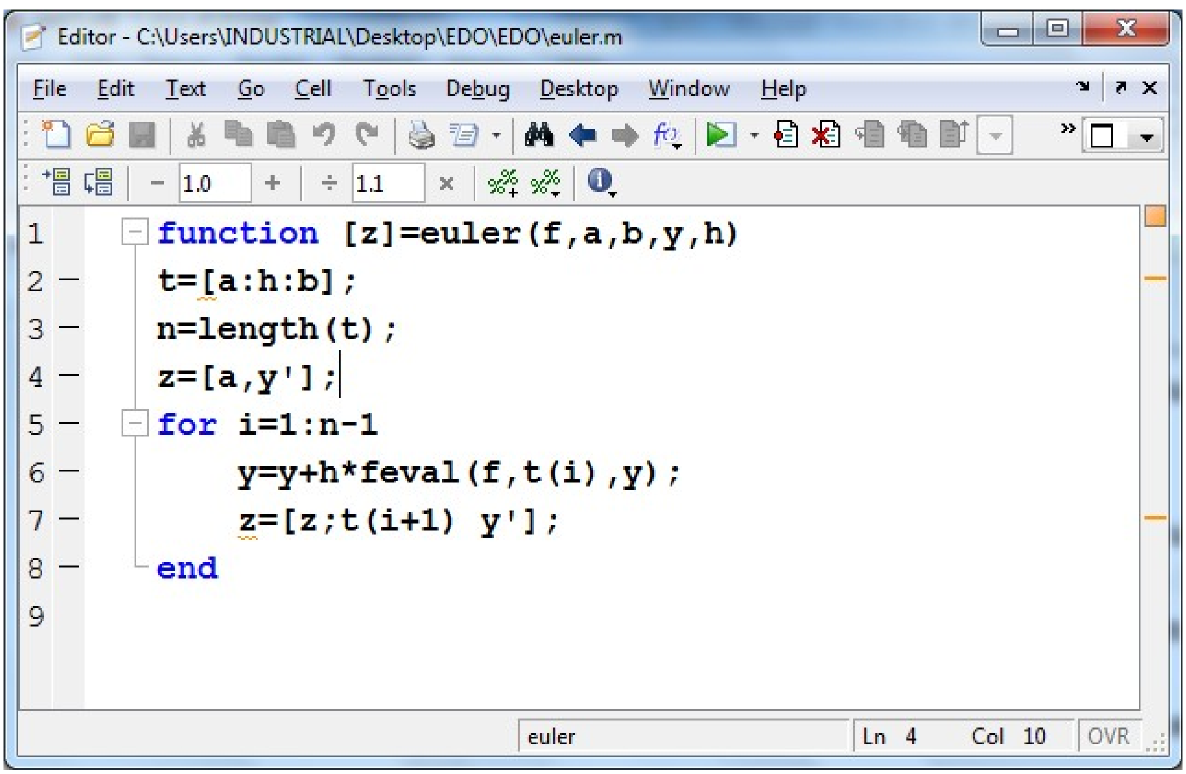
$$\textbf{b}\;\; y' = 1 + (t-y)^2, \quad 2 \le t \le 3, \quad y(2) = 1, \text{ com } h = 0,5$$

$$\textbf{c}\;\; y' = 1 + y/t, \quad 1 \le t \le 2, \quad y(1) = 2, \text{ com } h = 0,25$$

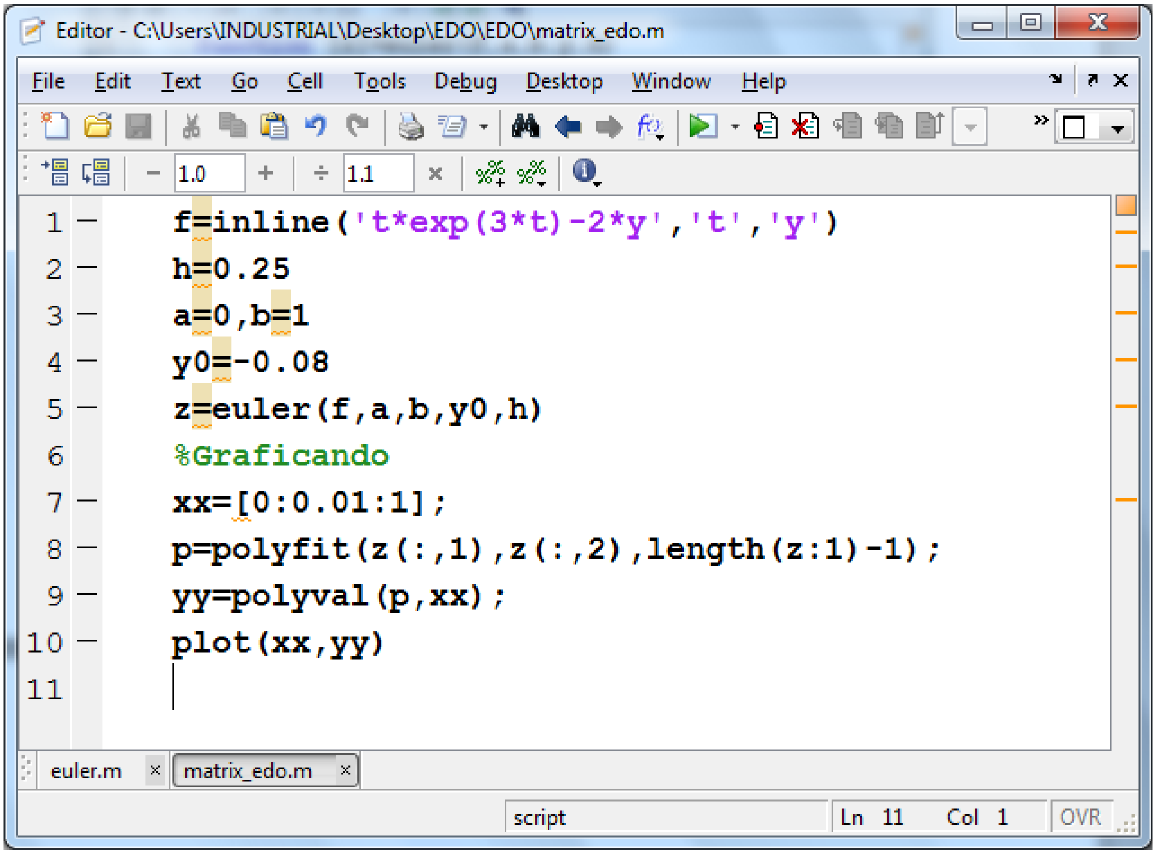
$$\textbf{d}\;\; y' = cos(2t) + sen(3t), \quad 0 \le t \le 1, \quad y(0) = 1 \text{ com } h = 0.25$$

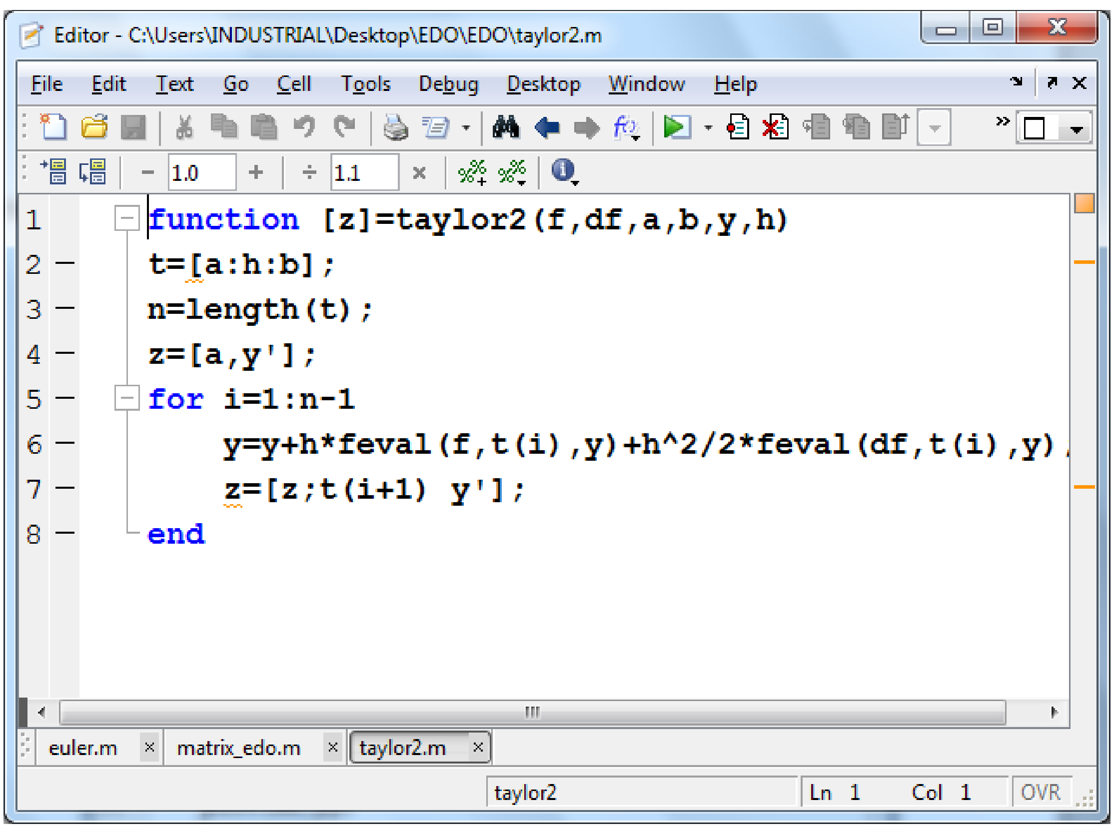
Solución:

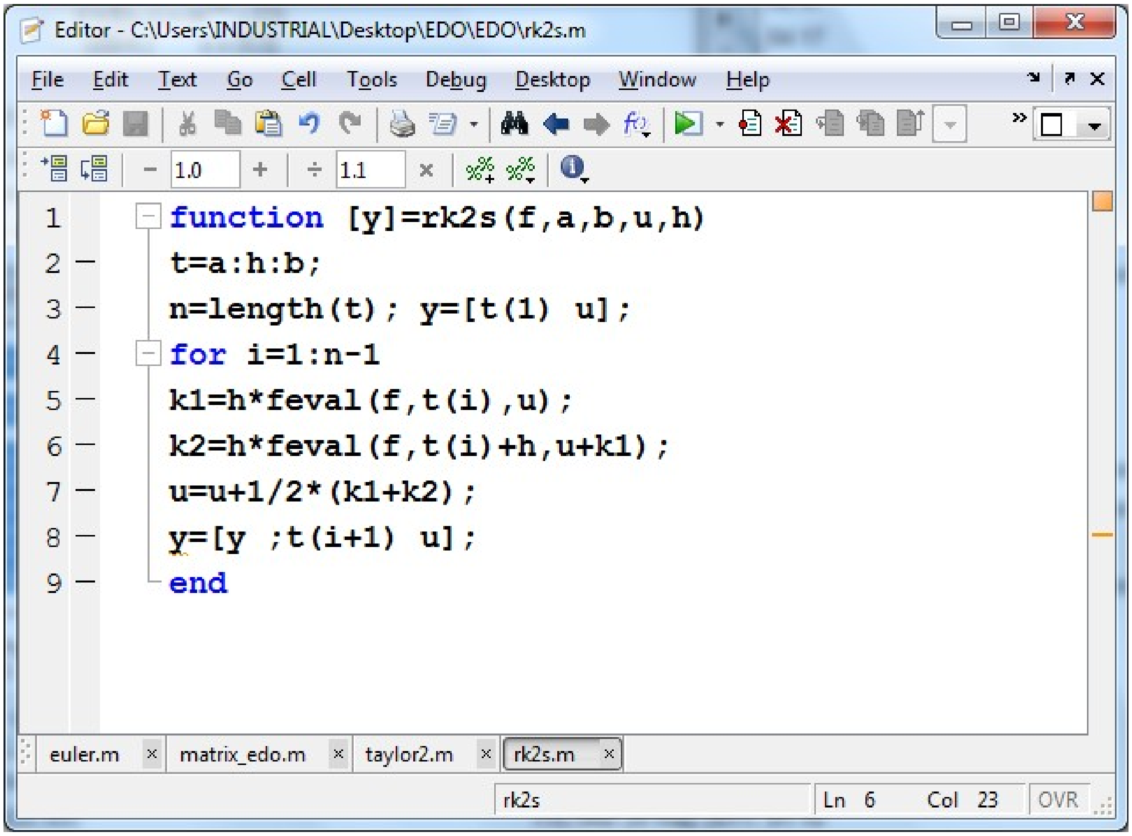
Utilizando Euler:

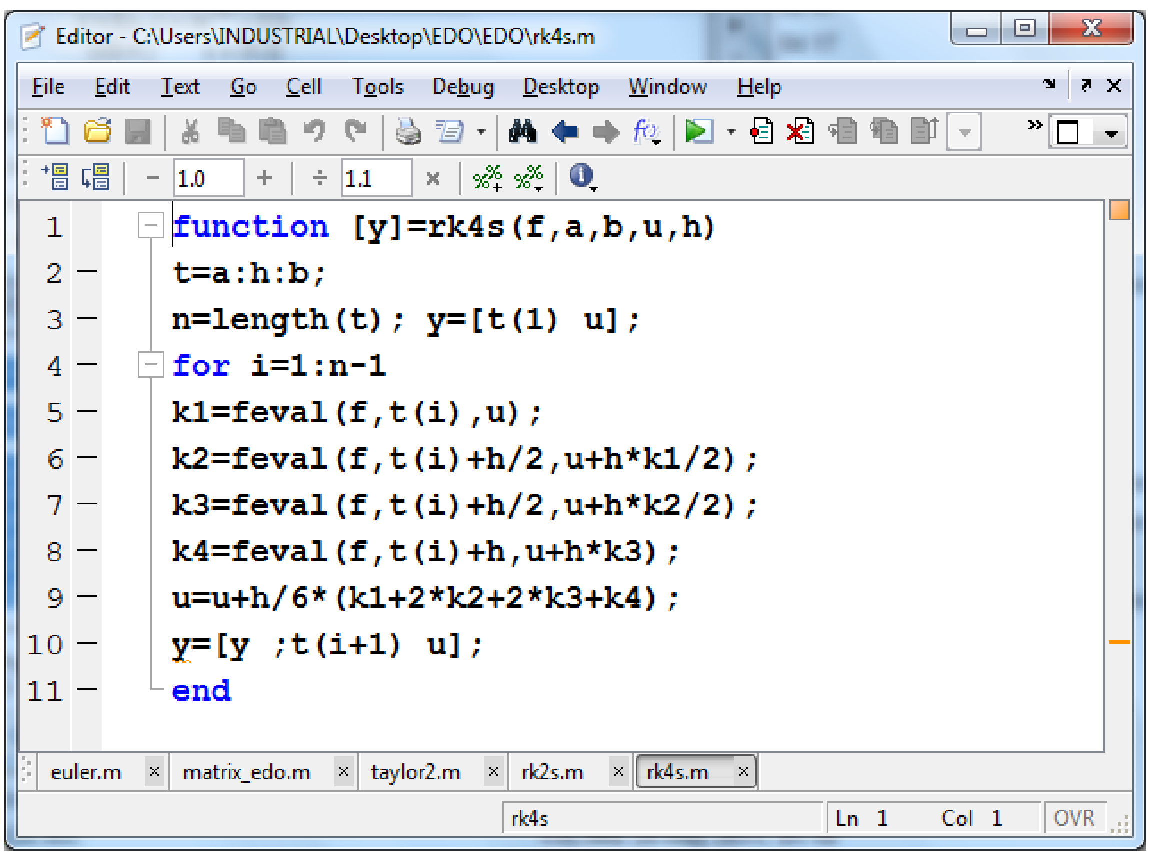



```
function [z]=euler(f,a,b,y,h)
t=[a:h:b];
n=length(t);
z=[a,y'];
for i=1:n-1
    y=y+h*feval(f,t(i),y);
    z=[z;t(i+1) y'];
end
```


Editor - C:\Users\INDUSTRIAL\Desktop\EDO\EDO\matrix_edo.m
File Edit Text Go Cell Tools Debug Desktop Window Help
1.0
1.1
f=inline('t*exp(3*t)-2*y','t','y')
h=0.25
a=0,b=1
y0=-0.08
z=euler(f,a,b,y0,h)
%Graficando
xx=[0:0.01:1];
p=polyfit(z(:,1),z(:,2),length(z:1)-1);
yy=polyval(p,xx);
plot(xx,yy)
euler.m
matrix_edo.m
script
Ln 11 Col 1
OVR

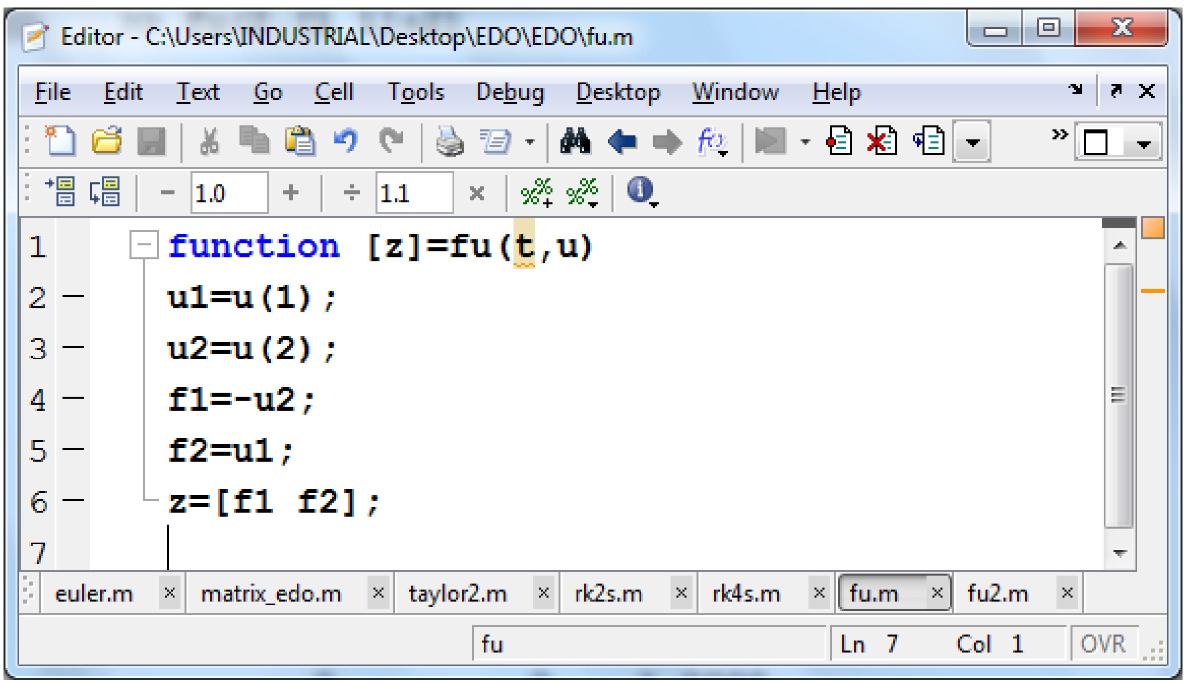

Editor - C:\Users\INDUSTRIAL\Desktop\EDO\EDO\taylor2.m
File Edit Text Go Cell Tools Debug Desktop Window Help
1.0
1.1
function [z]=taylor2(f,df,a,b,y,h)
t=[a:h:b];
n=length(t);
z=[a,y'];
for i=1:n-1
y=y+h*feval(f,t(i),y)+h^2/2*feval(df,t(i),y)
z=[z;t(i+1) y'];
end
euler.m
matrix_edo.m
taylor2.m
taylor2
Ln 1 Col 1
OVR


Editor - C:\Users\INDUSTRIAL\Desktop\EDO\EDO\rk2s.m
File Edit Text Go Cell Tools Debug Desktop Window Help
function [y]=rk2s(f,a,b,u,h)
t=a:h:b;
n=length(t); y=[t(1) u];
for i=1:n-1
k1=h*feval(f,t(i),u);
k2=h*feval(f,t(i)+h,u+k1);
u=u+1/2*(k1+k2);
y=[y ;t(i+1) u];
end
euler.m matrix_edo.m taylor2.m rk2s.m
rk2s Ln 6 Col 23 OVR


Editor - C:\Users\INDUSTRIAL\Desktop\EDO\EDO\rk4s.m
File Edit Text Go Cell Tools Debug Desktop Window Help
function [y]=rk4s(f,a,b,u,h)
t=a:h:b;
n=length(t); y=[t(1) u];
for i=1:n-1
k1=feval(f,t(i),u);
k2=feval(f,t(i)+h/2,u+h*k1/2);
k3=feval(f,t(i)+h/2,u+h*k2/2);
k4=feval(f,t(i)+h,u+h*k3);
u=u+h/6*(k1+2*k2+2*k3+k4);
y=[y ;t(i+1) u];
end
euler.m matrix_edo.m taylor2.m rk2s.m rk4s.m
rk4s Ln 1 Col 1 OVR

2. Resolver el sistema de ecuaciones diferenciales en el intervalo [0,1] con h=0.5 utilizando el método de Runge Kutta de segundo orden y de cuarto orden.

$$\begin{cases} \dfrac{dx}{dt} = -y \\ \\ \dfrac{dy}{dt} = x \end{cases}, x(0) = 0, \quad y(0) = 1$$




```
>> z=rk2s('fu',0,1,[0 1],0.5)

z =

         0         0    1.0000
    0.5000   -0.5000    0.8750
    1.0000   -0.8750    0.5156
```

3. La ecuación de Van der Pol es

$$y^{''} + (1 - y^2)y^{'} + y = 0$$

Con las condiciones iniciales y(0)=0.5 , y’(0)=0. Obtener los valores de y, y’, y’’ en t=0.4, usando el método de Runge Kutta de orden 2.