	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**

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

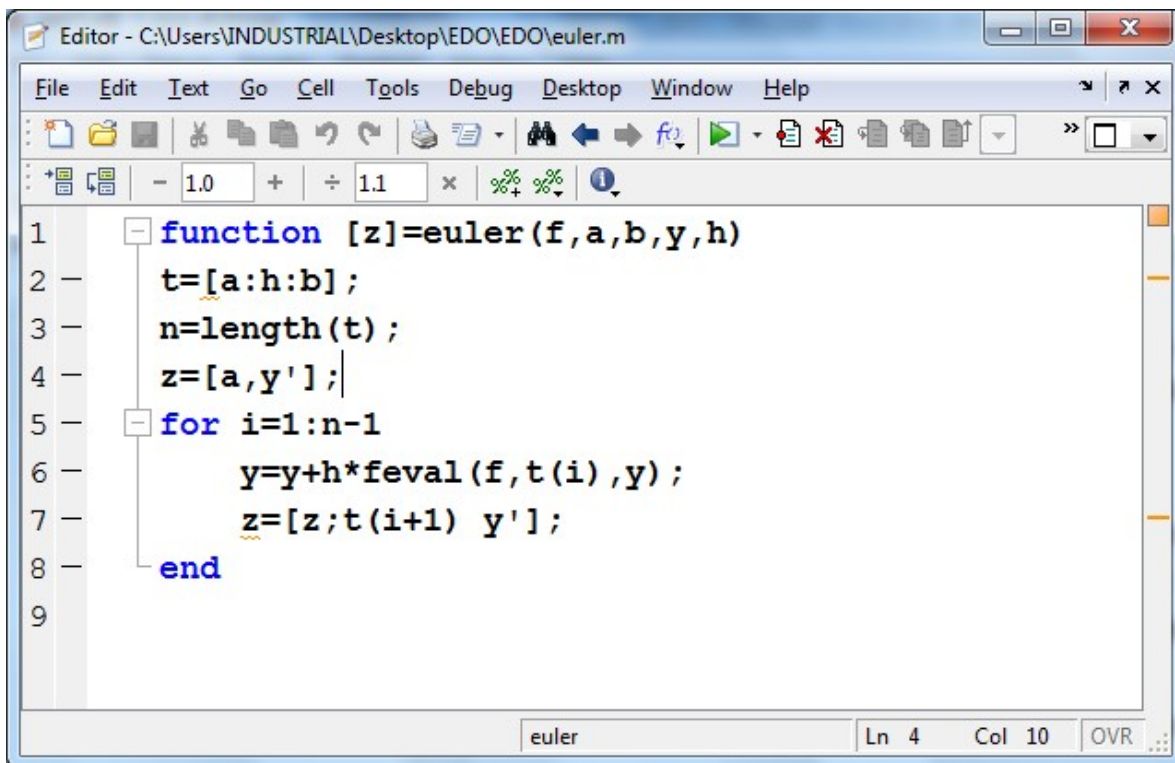
b $y' = 1 + (t - y)^2, \quad 2 \leq t \leq 3, \quad y(2) = 1, \text{ con } h = 0,5$

c $y' = 1 + y/t, \quad 1 \leq t \leq 2, \quad y(1) = 2, \text{ con } h = 0,25$

d $y' = \cos(2t) + \text{sen}(3t), \quad 0 \leq t \leq 1, \quad y(0) = 1 \text{ con } h = 0.25$

Solución:

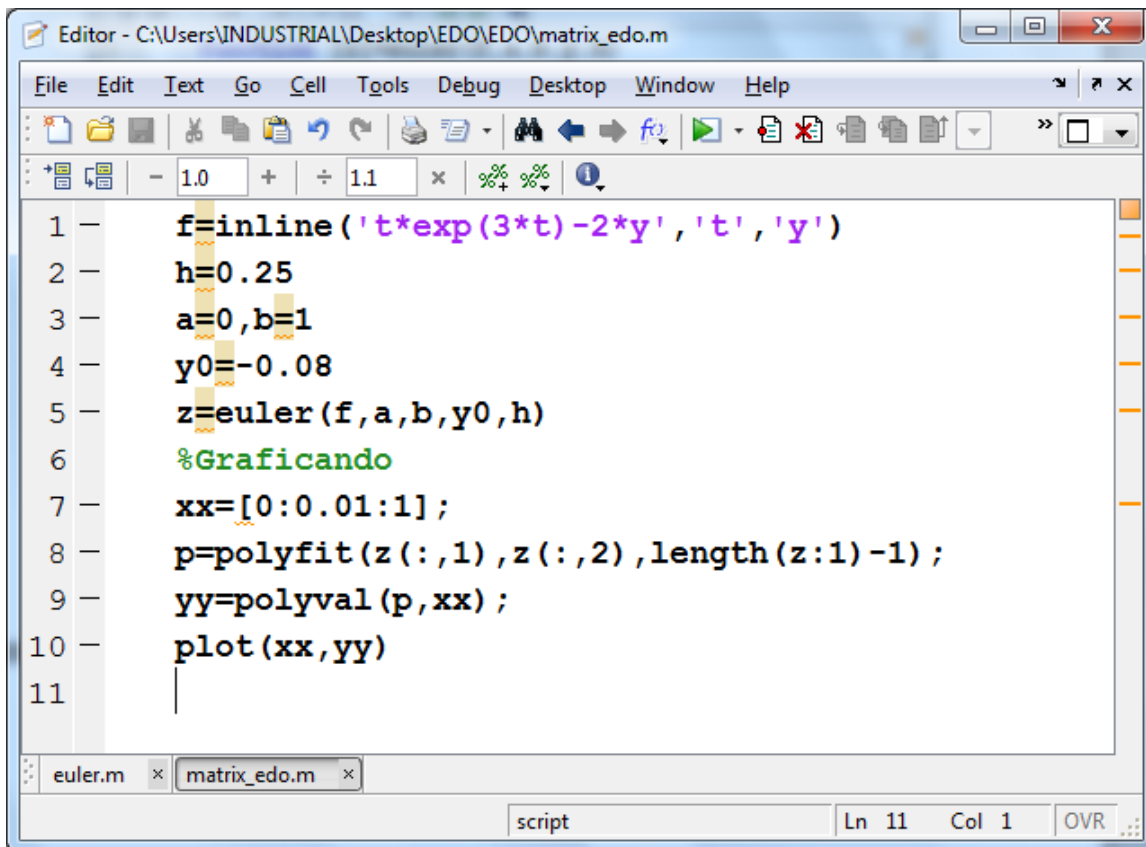
Utilizando Euler:



```

Editor - C:\Users\INDUSTRIAL\Desktop\EDO\EDO\euler.m
File Edit Text Go Cell Tools Debug Desktop Window Help
- 1.0 + ÷ 1.1 x % % !
1 function [z]=euler(f,a,b,y,h)
2     t=[a:h:b];
3     n=length(t);
4     z=[a,y'];
5     for i=1:n-1
6         y=y+h*feval(f,t(i),y);
7         z=[z;t(i+1) y'];
8     end
9
euler Ln 4 Col 10 OVR

```

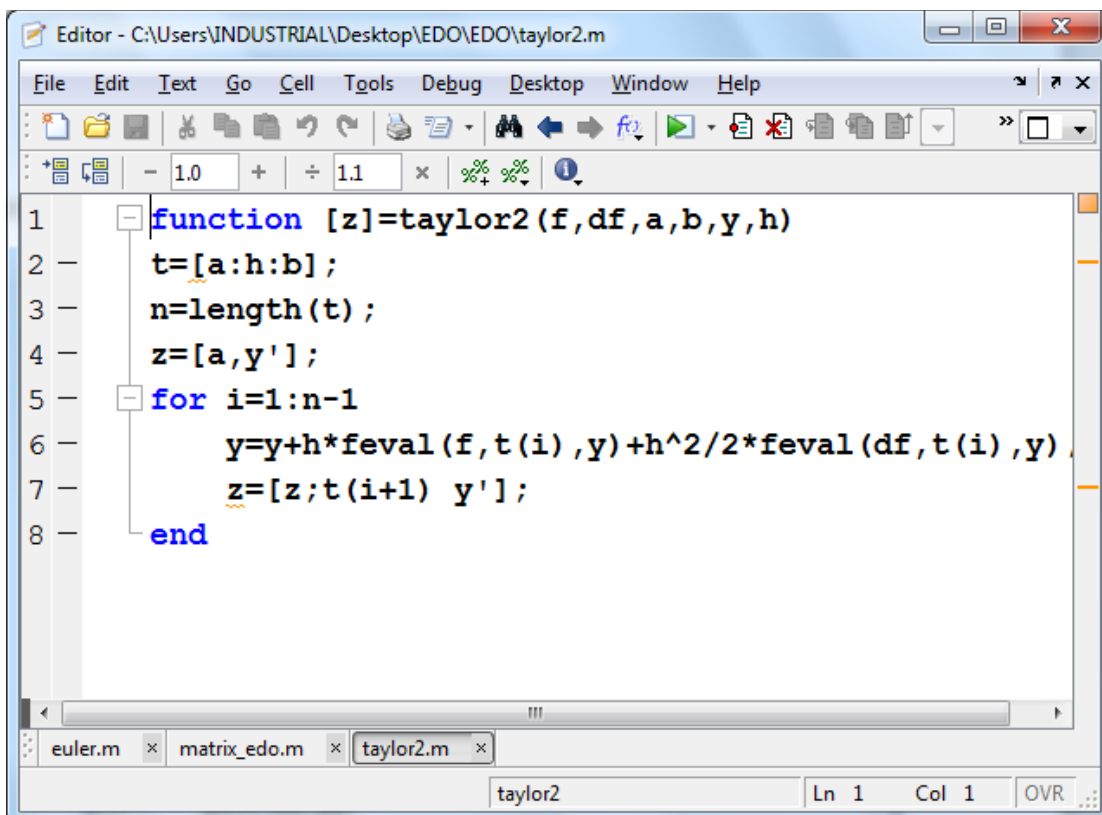


Editor - C:\Users\INDUSTRIAL\Desktop\EDO\EDO\matrix_edo.m

```
File Edit Text Go Cell Tools Debug Desktop Window Help
- 1.0 + ÷ 1.1 x % %
1 - f=inline('t*exp(3*t)-2*y','t','y')
2 - h=0.25
3 - a=0,b=1
4 - y0=-0.08
5 - z=euler(f,a,b,y0,h)
6 - %Graficando
7 - xx=[0:0.01:1];
8 - p=polyfit(z(:,1),z(:,2),length(z:1)-1);
9 - yy=polyval(p,xx);
10 - plot(xx,yy)
11 -
```

euler.m x matrix_edo.m x

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 x % %
1 - function [z]=taylor2(f,df,a,b,y,h)
2 - t=[a:h:b];
3 - n=length(t);
4 - z=[a,y'];
5 - for i=1:n-1
6 -     y=y+h*feval(f,t(i),y)+h^2/2*feval(df,t(i),y);
7 -     z=[z;t(i+1) y'];
8 - end
```

euler.m x matrix_edo.m x taylor2.m x

taylor2 Ln 1 Col 1 OVR

The screenshot shows a MATLAB editor window titled "Editor - C:\Users\INDUSTRIAL\Desktop\EDO\EDO\rk2s.m". The window contains the following code:

```
1 function [y]=rk2s(f,a,b,u,h)
2     t=a:h:b;
3     n=length(t); y=[t(1) u];
4     for i=1:n-1
5         k1=h*feval(f,t(i),u);
6         k2=h*feval(f,t(i)+h,u+k1);
7         u=u+1/2*(k1+k2);
8         y=[y ;t(i+1) u];
9     end
```

The status bar at the bottom indicates the current file is "rk2s", the cursor is at line 6, column 23, and the window is in "OVR" (Overwrite) mode.

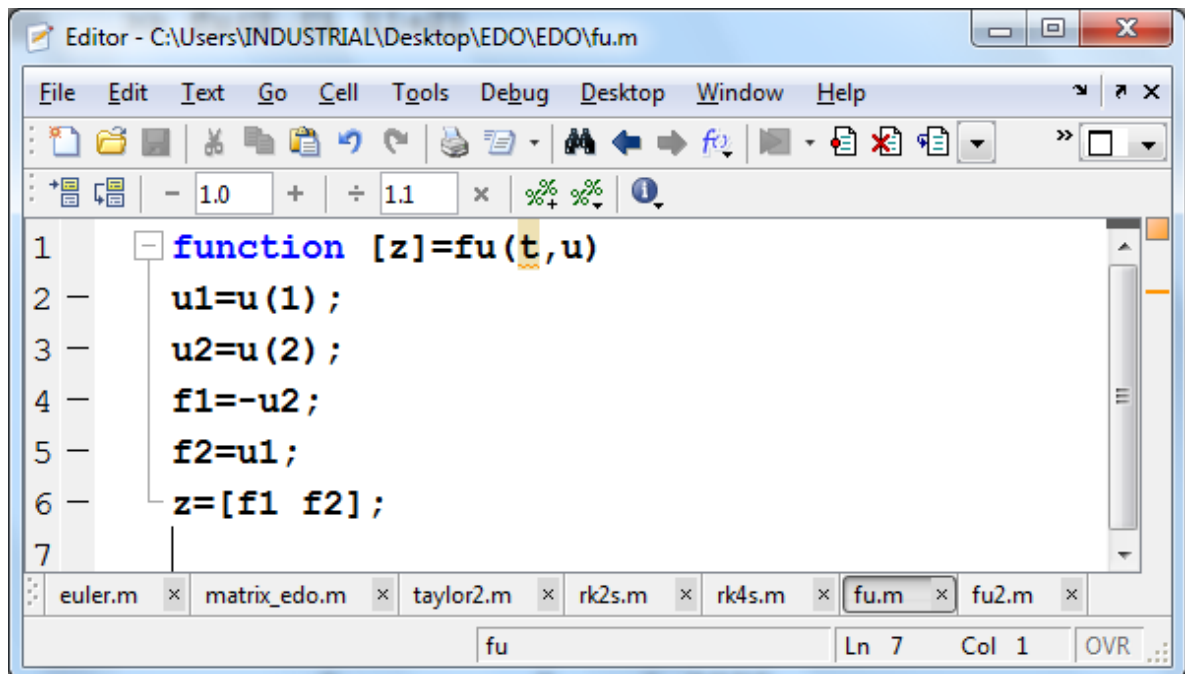
The screenshot shows a MATLAB editor window titled "Editor - C:\Users\INDUSTRIAL\Desktop\EDO\EDO\rk4s.m". The window contains the following code:

```
1 function [y]=rk4s(f,a,b,u,h)
2     t=a:h:b;
3     n=length(t); y=[t(1) u];
4     for i=1:n-1
5         k1=feval(f,t(i),u);
6         k2=feval(f,t(i)+h/2,u+h*k1/2);
7         k3=feval(f,t(i)+h/2,u+h*k2/2);
8         k4=feval(f,t(i)+h,u+h*k3);
9         u=u+h/6*(k1+2*k2+2*k3+k4);
10        y=[y ;t(i+1) u];
11    end
```

The status bar at the bottom indicates the current file is "rk4s", the cursor is at line 1, column 1, and the window is in "OVR" (Overwrite) mode.

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.

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



The screenshot shows a MATLAB editor window titled "Editor - C:\Users\INDUSTRIAL\Desktop\EDO\EDO\fu.m". The window contains the following code:

```
1 function [z]=fu(t,u)
2     u1=u(1);
3     u2=u(2);
4     f1=-u2;
5     f2=u1;
6     z=[f1 f2];
7
```

The window also shows a toolbar with various icons and a status bar at the bottom indicating "Ln 7 Col 1 OVR".

```
>> 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.