Escuela Profesional de Ciencias de la Computación
Curso: Análisis Numérico
2024-01
**Laboratorio 2.4**

Grupo : CCOMP5-1
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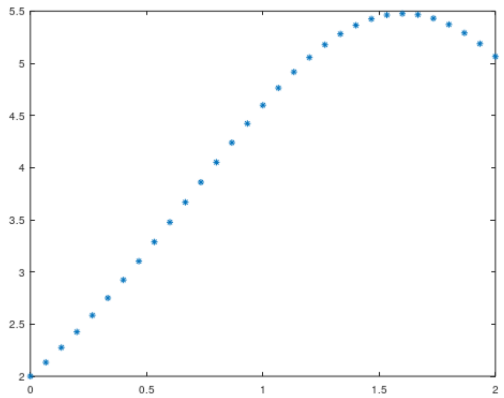
Fecha : 13 de junio del 2024
Alumno :

**Ejercicios:**

1. Resuelva numéricamente el problema, usando el método de Euler:

$$\frac{dx}{dt} = x\cos(t)\ ; \qquad x(0) = 2\,, \qquad t \in [0,2], \qquad p = 30$$

Adjunte el grafico de la solución encontrada.



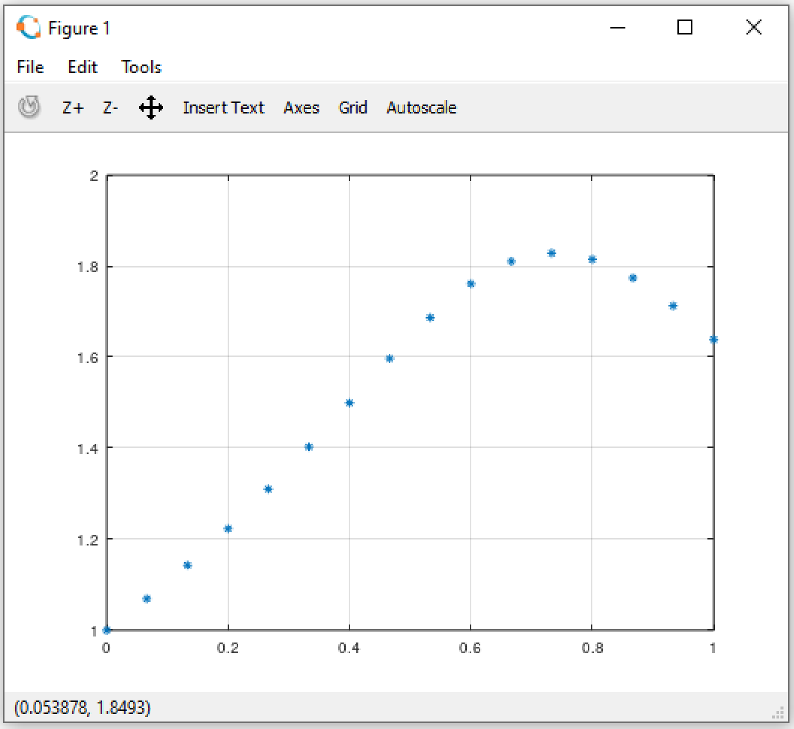

| T: | Y: |
|---|---|
| 0.00000 | 2.0000 |
| 0.06667 | 2.1333 |
| 0.13333 | 2.2752 |
| 0.20000 | 2.4256 |
| 0.26667 | 2.5841 |
| 0.33333 | 2.7502 |
| 0.40000 | 2.9235 |
| 0.46667 | 3.1030 |
| 0.53333 | 3.2878 |
| 0.60000 | 3.4765 |
| 0.66667 | 3.6678 |
| 0.73333 | 3.8600 |
| 0.80000 | 4.0511 |
| 0.86667 | 4.2393 |
| 0.93333 | 4.4223 |
| 1.00000 | 4.5977 |
| 1.06667 | 4.7633 |
| 1.13333 | 4.9167 |
| 1.20000 | 5.0556 |
| 1.26667 | 5.1777 |
| 1.33333 | 5.2811 |
| 1.40000 | 5.3639 |
| 1.46667 | 5.4247 |
| 1.53333 | 5.4623 |
| 1.60000 | 5.4759 |
| 1.66667 | 5.4653 |
| 1.73333 | 5.4304 |
| 1.80000 | 5.3718 |
| 1.86667 | 5.2904 |
| 1.93333 | 5.1876 |
| 2.00000 | 5.0649 |

2. Utilice el método de Taylor para resolver numéricamente el problema:

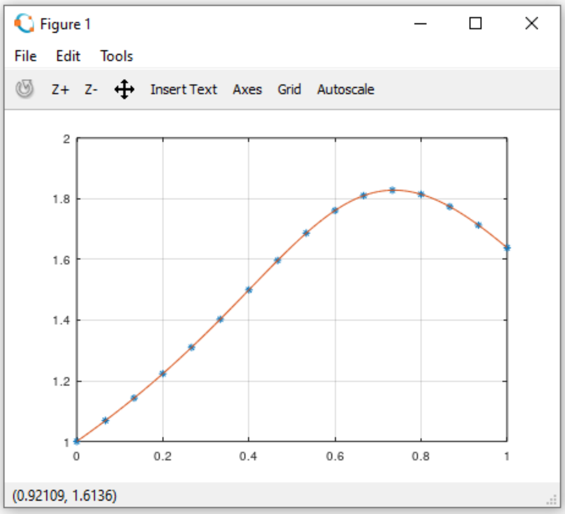
$$\begin{cases} y' = y^2\cos(ty) - t\,, & t \in [0,1] \\ & y(0) = 1 \end{cases}$$

Utilice 15 particiones. Grafique los puntos solución y el polinomio interpolador en el intervalo indicado.

```
>> f = @(t,y) (y.^2)*cos(t.*y)-t;
>> ft = @(t,y) (y.^2).*(-sin(t.*y)).*y-1;
>> fy = @(t,y) (2.*y).*(cos(t.*y)) + (y.^2).*(-sin(t.*y)).*t;
>> [t,y] = TAYLOR(f,ft,fy,0,1,1,15);
>> [t,y]
ans =

   0.00000   1.00000
   0.06667   1.06889
   0.13333   1.14308
   0.20000   1.22331
   0.26667   1.30996
   0.33333   1.40264
   0.40000   1.49949
   0.46667   1.59648
   0.53333   1.68673
   0.60000   1.76106
   0.66667   1.81019
   0.73333   1.82814
   0.80000   1.81454
   0.86667   1.77388
   0.93333   1.71291
   1.00000   1.63823
```



```
>> p = lagrange(t',y')
p =

 Columns 1 through 5:

     3248.35235   -23488.25507    76141.72293  -146361.55715   186115.78619

 Columns 6 through 10:

  -165528.48545   106177.49460   -49878.56114    17221.35991    -4342.37418

 Columns 11 through 15:

      783.44752      -97.86388        8.43904        0.12732        1.00532

 Column 16:

        1.00000

>> x = 0:0.01:1;
>> hold on
>> plot(x,polyval(p,x))
>> |
```




3. Resuelva numéricamente el problema, utilizando 20 particiones.

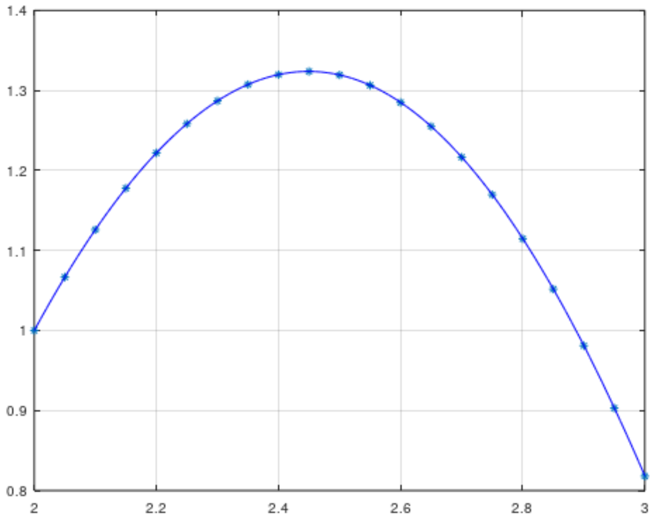
$$\begin{cases} y' = \dfrac{ty^2 - t^3 + 10}{t^2 - y}, & t \in [2,3] \\ \qquad y(2) = 1 \end{cases}$$

a. Utilice el método de Euler, grafique los puntos solución y el polinomio interpolador en el intervalo indicado y exhiba los vectores solución.

```
>> f=@(t,y) (t.*y^2 - t.^3 +10)./(t.^2-y);
>> [t,y]=EULER(f,2,1,1,20)
```

```
t =

    2.0000
    2.0500
    2.1000
    2.1500
    2.2000
    2.2500
    2.3000
    2.3500
    2.4000
    2.4500
    2.5000
    2.5500
    2.6000
    2.6500
    2.7000
    2.7500
    2.8000
    2.8500
    2.9000
    2.9500
    3.0000
```

```
y =

   1.00000
   1.06667
   1.12594
   1.17772
   1.22190
   1.25834
   1.28689
   1.30740
   1.31972
   1.32373
   1.31931
   1.30640
   1.28495
   1.25497
   1.21651
   1.16969
   1.11467
   1.05168
   0.98098
   0.90292
   0.81787
```




```
>> hold on
>> set(gca,'xaxislocation','origin')
>> set(gca,'yaxislocation','origin')
>> grid on
```

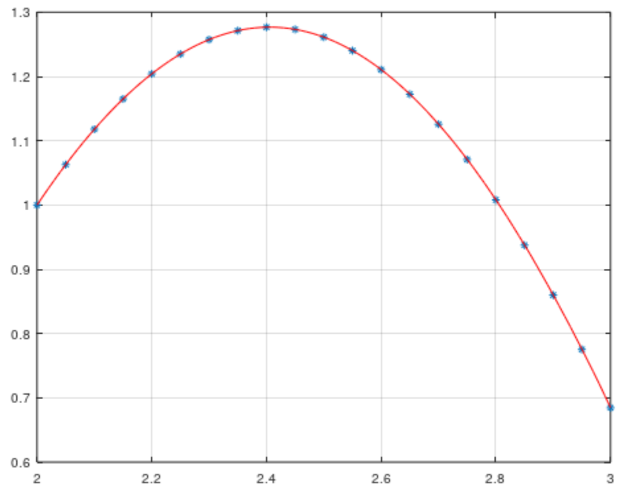
```
>> p = newtonp(t',y')
p =

 Columns 1 through 5:

          0.013623          -0.676246           15.966027         -238.388326

 Columns 6 through 10:

      -20152.512249       125827.095696      -629148.355138      2558269.226762

 Columns 11 through 15:

    23544365.688464    -53657488.293339    100914587.331646   -155745602.891597

 Columns 16 through 20:

  -195856644.366739    153397689.220311    -90410986.040663     37718423.988792

 Column 21:

     1240458.813006
```

b. Utilice el método de Taylor, grafique los puntos solución y el polinomio interpolador en el intervalo indicado y exhiba los vectores solución.

```
>> f=@(t,y) (t.*y^2 - t.^3 +10)./(t.^2-y);
>> dt=@(t,y) (-t.^2.*y.^2 - y.^3 - t.^4 + 3.*t.^2.*y - 20.*t)./(t.^2-y).^2;
>> dy=@(t,y) (2.*t.^3.*y - t.*y.^2 -t.^3 +10)./(t.^2-y).^2;
>> [t,y]=TAYLOR(f,dt,dy,2,1,1,20)
```

```
t =

   2.0000
   2.0500
   2.1000
   2.1500
   2.2000
   2.2500
   2.3000
   2.3500
   2.4000
   2.4500
   2.5000
   2.5500
   2.6000
   2.6500
   2.7000
   2.7500
   2.8000
   2.8500
   2.9000
   2.9500
   3.0000
```

```
y =

   1.00000
   1.06282
   1.11786
   1.16498
   1.20403
   1.23487
   1.25734
   1.27130
   1.27663
   1.27325
   1.26111
   1.24020
   1.21058
   1.17235
   1.12568
   1.07078
   1.00794
   0.93748
   0.85980
   0.77530
   0.68446
```



```
>> P=newtonp(t',y')
P =

 Columns 1 through 5:

          0.033561           -1.648416           38.499651         -568.580882

 Columns 6 through 10:

     -47031.171495       290558.147798     -1438011.556928      5790247.620721

 Columns 11 through 15:

   52341118.139141   -118334165.713076    220936939.283511   -338758314.858612

 Columns 16 through 20:

 -421438774.815404    328682309.326786   -193047696.051099     80314775.000979

 Column 21:

    2632064.301647
```

```
>> dom=2:0.01:3;
>> ran=polyval(P,dom);
>> plot(dom,ran,'r')
```