Escuela Profesional de Ciencias de la Computación
Curso: Análisis Numérico
2024-1

Control N°2

Grupo : CCOMP5-1
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Alumno :

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1. **(5 pts)** Sea la función $f(x) = 3\cos(x^2 + 2) + 2^x$ determine:

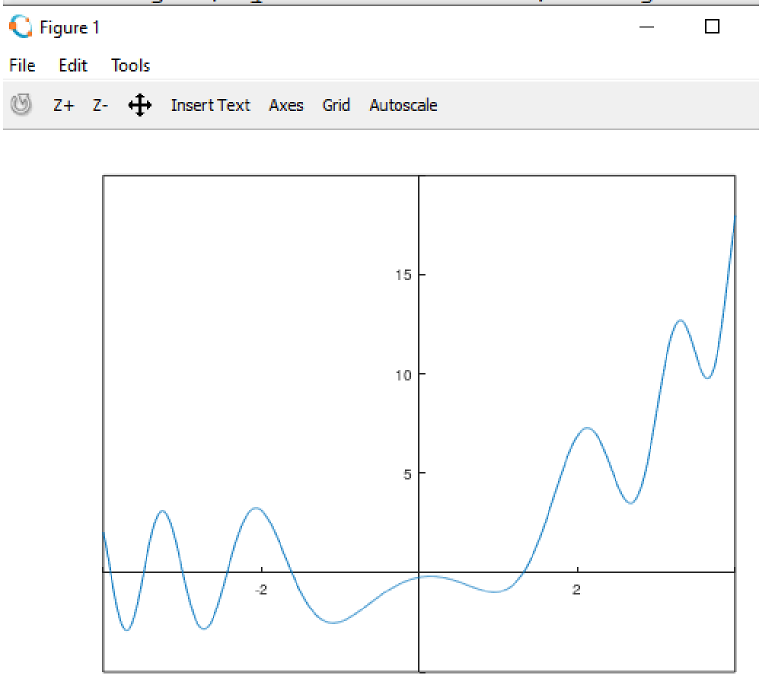
   a) Exhiba el gráfico de la función.

   b) Determine intervalos cada uno de amplitud 0.4 que contengan a las 2 raíces más próximas a cero de la función. Calcule las raíces, mostrando la cantidad de iteraciones y aproximación a la raíz con una tolerancia de 0.00001. Usando Bisección en Octave.

   c) Haciendo uso de Secante muestre la cantidad de iteraciones y las raíces, use la tolerancia del anterior ítem.

a)

```
>> f1=@(x) 3.*cos(x.^2+2)+2.^x;
>> dom1=-4:0.01:4;
>> plot(dom1,f1(dom1))
>> set(gca,"xaxislocation","origin")
>> set(gca,"yaxislocation","origin")
```



b)

```
>> intervalos(f1,-3,3,0.4)
|    x     |    f(x)
| -3.00    |    0.1382770940
| -2.60    |    -2.1962228423
| -2.20    |    2.7644660443
| -1.80    |    1.7975866030
| -1.40    |    -1.6712252691
| -1.00    |    -2.4699774898
| -0.60    |    -1.4696237137
| -0.20    |    -0.4859779231
| 0.20    |    -0.2078301314
| 0.60    |    -0.6136611026
| 1.00    |    -0.9699774898
| 1.40    |    0.5888614108
| 1.80    |    4.9926142674
| 2.20    |    7.1416218235
| 2.60    |    3.7017049348
| 3.00    |    8.0132770940
>> a1=-1.8;
>> b1=-1.4;
>> a2=1;
>> b2=1.4;
```

```
>> bistec(f1,a1,b1,0.00001)
|    k    |       m        |
|     0   |      -1.60000000     |
|     1   |      -1.70000000     |
|     2   |      -1.65000000     |
|     3   |      -1.62500000     |
|     4   |      -1.61250000     |
|     5   |      -1.61875000     |
|     6   |      -1.61562500     |
|     7   |      -1.61406250     |
|     8   |      -1.61328125     |
|     9   |      -1.61367188     |
|    10   |      -1.61347656     |
|    11   |      -1.61337891     |
|    12   |      -1.61342773     |
|    13   |      -1.61345215     |
|    14   |      -1.61346436     |
|    15   |      -1.61345825     |
La raiz es -1.6134583
ans = -1.6135
```

```
>> bistec(f1,a2,b2,0.00001)
|    k    |       m        |
|     0   |      1.20000000     |
|     1   |      1.30000000     |
|     2   |      1.35000000     |
|     3   |      1.32500000     |
|     4   |      1.31250000     |
|     5   |      1.31875000     |
|     6   |      1.31562500     |
|     7   |      1.31718750     |
|     8   |      1.31640625     |
|     9   |      1.31679687     |
|    10   |      1.31660156     |
|    11   |      1.31650391     |
|    12   |      1.31645508     |
|    13   |      1.31643066     |
|    14   |      1.31641846     |
|    15   |      1.31642456     |
La raiz es 1.3164246
ans =  1.3164
```

c)

```
>> g1s=@(x,h) x-f1(x)*h/(f1(x+h)-f1(x));
>> secante(g1s,a1,0.00001)
|    k     |       m        |
|       0     |      -1.800000       |
|       1     |      -1.603161       |
|       2     |      -1.613512       |
|       3     |      -1.613454       |
ans = -1.6135
```

```
>> secante(g1s,1.2,0.00001)
|    k     |       m        |
|       0     |      1.200000       |
|       1     |      1.353677       |
|       2     |      1.318623       |
|       3     |      1.316439       |
ans =  1.3164
```

2. **(3 pts)** Para la función:

$$f(x) = 3^{x^2} + \sin(x-1) - \frac{5}{2}$$

Señale tres funciones asociadas para el método de punto fijo.

$$\theta 1 \rightarrow x = +\sqrt{\log_3(\tfrac{5}{2} - \sin(x-1))}$$

$$\theta 2 \rightarrow x = -\sqrt{\log_3(\tfrac{5}{2} - \sin(x-1))}$$

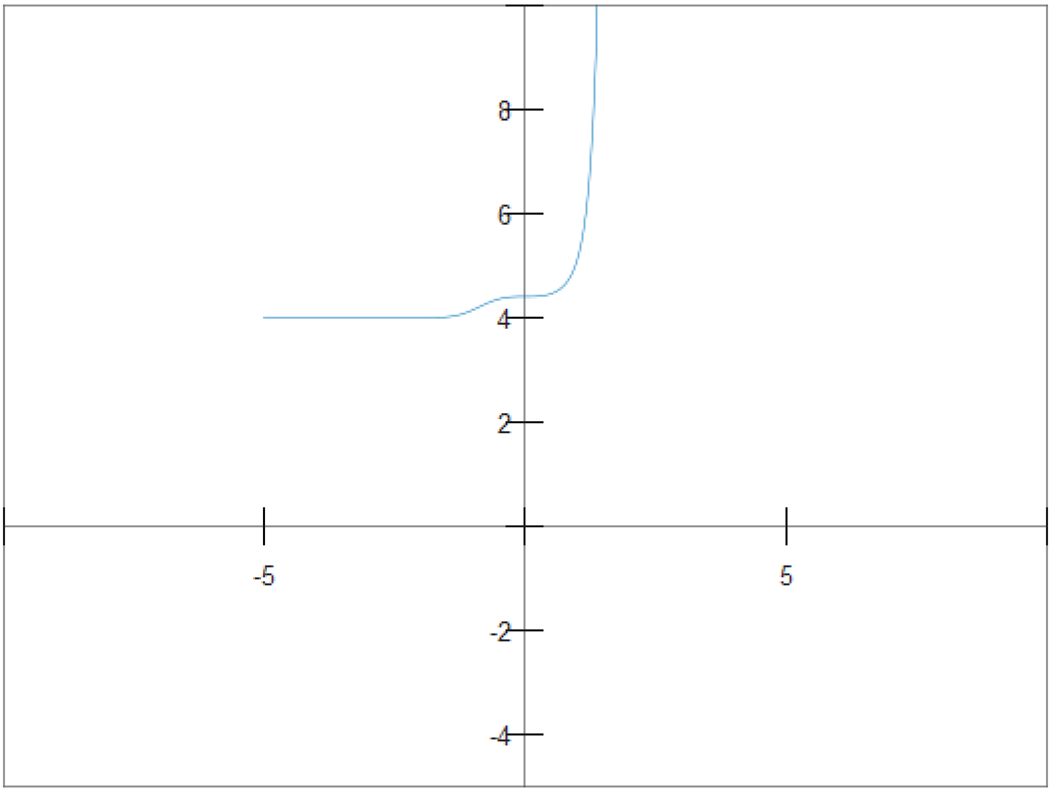
$$\theta 3 \rightarrow x = \arcsin\left(\tfrac{5}{2} - 3^{x^2}\right) + 1$$

3. **(4 pts)** Encuentre la distancia mínima de punto $P(2,6)$ a la función:

$$f(x) = 3e^{x^3-2} + 4$$

Haga uso de Newton

```
>> f = @(x) 3.*exp(x.^3 - 2) + 4;
>> fd1 = @(x) 9.*exp(x.^3 - 2).*x^2;
>> fd2 = @(x) 27.*exp(x.^3 - 2).*x^4 + 18.*exp(x^3-2).*x;
>> d1 = @(x) (2.*(x - 2) + 2.*(f(x) - 6).*fd1(x))/2;
>> d2 = @(x) (2 + 2.*(fd1(x).^2 + fd2(x).*(f(x) - 6)))/2;
>> fn = @(x) x - d1(x)./d2(x);
>> graphics_toolkit gnuplot
>> x = -5:0.01:10;
>> plot(x,f(x));
>> ylim([-5 10]);
set(gca, "xaxislocation", "origin");
set(gca, "yaxislocation", "origin");
fn = @(x) x - d1(x)./d2(x);
```



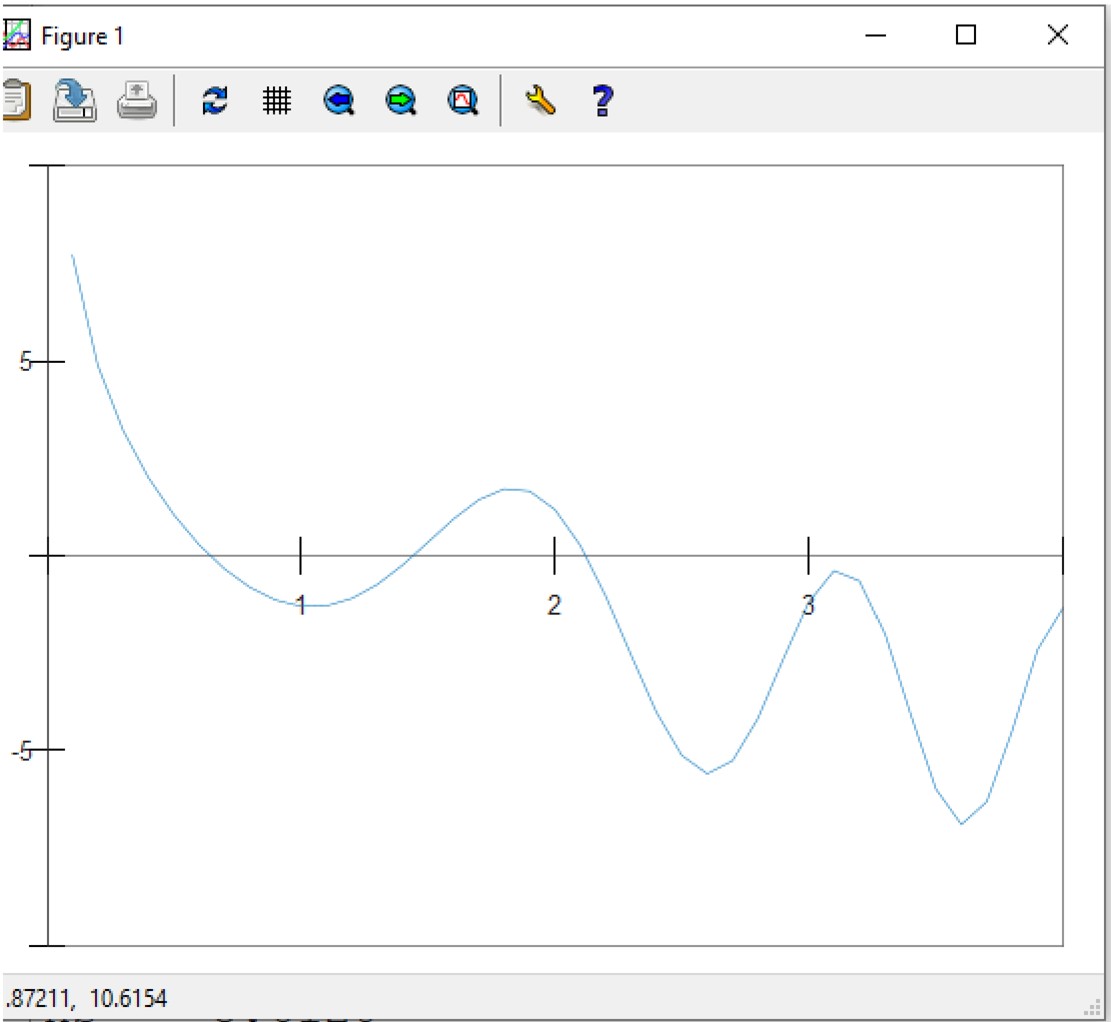
```
>> intervalos(d1, 0, 3,0.4);
|   x     |    f(x)
| 0.00    |    -4.0000000000
| 0.40    |    -3.8511960810
| 0.80    |    -5.8405455460
| 1.20    |    4.0390832264
| 1.60    |    8394.8730147687
| 2.00    |    35096941.2002418861
| 2.40    |    5794420784768.3310546875
| 2.80    |    905308978904768184 32.0000000000
```

```
>> newton(fn, 1.1, 0.00001);
|    k      |       m         |
|       0     |       1.100000         |
|       1     |       1.293221         |
|       2     |       1.239634         |
|       3     |       1.200795         |
|       4     |       1.182724         |
|       5     |       1.179468         |
|       6     |       1.179376         |
>> |
```

```
>> d = @(x) sqrt((x-2).^2 + (f(x) - 6).^2);
>> d(1.179376)
ans =  0.82598
>> |
```

4. **(4 pts)** Haciendo uso del método de Newton, encuentre los valores máximos para la función abajo mencionada en el dominio indicado:

$$f(x) = 3\sin(x^2 - 2) - 4\ln(2x) + 4 \qquad , 0 < x < 4$$




```
> plot(x,f4(x))
> set(gca, "xaxislocation", "origin");
> set(gca, "yaxislocation", "origin");
```

```
> df4=@(x) 3.*cos(x.^2-2).*2.*x-4./x
```

```
gf4=@(x) x-df4(x)/(6*cos(x^2-2)+(6*x*(-sin(x^2-2)*2*x))-(4/x*log(4)*(-1))
```

```
newton(gf4,1,0.00001)
 k     |      m       |
    0     |      1.000000        |
    1     |      1.040148        |
    2     |      1.043014        |
    3     |      1.043255        |
    4     |      1.043276        |
 =  1.0433
newton(gf4,1.6,0.00001)
 k     |      m       |
    0     |      1.600000        |
    1     |      2.325166        |
    2     |      3.443891        |
    3     |      3.797734        |
    4     |      3.129328        |
    5     |      3.128215        |
    6     |      3.128227        |
 =  3.1282
newton(gf4,2.4,0.00001)
 k     |      m       |
    0     |      2.400000        |
    1     |      2.757394        |
    2     |      2.579171        |
    3     |      2.609648        |
    4     |      2.609680        |
 =  2.6097
```

```
newton(gf4,1.7,0.00001)
 k      |       m         |
      0     |       1.700000        |
      1     |       1.904267        |
      2     |       1.837379        |
      3     |       1.836179        |
      4     |       1.836239        |
 =  1.8362
newton(gf4,3.6,0.00001)
 k      |       m         |
      0     |       3.600000        |
      1     |       3.611990        |
      2     |       3.612021        |
 =  3.6120
```

```
> f4(1.8362)
ns =  1.7373
> f4(3.1282)
ns = -0.34142
>
```

5. **(4 pts)** Genere dos funciones que les permitan regresar una matriz A y una matriz B para cualquier tamaño n ingresado, siendo:

$$A = [a_{i,j}]_{n\times n} \quad , \quad B = [b_{i,j}]_{n\times n}$$

$$a_{i,j} = \begin{cases} i(-2)^j + j \;, & i < j \\ (j)^2 - 3j - 1 \;, & i \geq j \end{cases} \quad , \quad b_{i,j} = \begin{cases} (-2)^j + 2i \;, & i \geq j \\ j - 2i \;, & i < j \end{cases}$$

Sea la ecuación matricial $AYB + 5YB = BYB - 2A$, determine el valor de la matriz Y, cuando $n = 4$, exhibir la respuesta en decimales.

```
function A = matrizA(n)
  for i=1:n
    for j=1:n
      if i<j
        A(i,j)=i*(-2)^j+j;
      else
        A(i,j)=j^2-3*j-1;
      endif
    endfor
  endfor
endfunction
```

```
function A = matrizB(n)
  for i=1:n
    for j=1:n
      if i<j
        A(i,j)=j-2*i;
      else
        A(i,j)=(-2)^j+2*i;
      endif
    endfor
  endfor
endfunction
```

```
I =

Diagonal Matrix

   1   0   0   0
   0   1   0   0
   0   0   1   0
   0   0   0   1

>> A = matrizA(4)
A =

   -3    6   -5   20
   -3   -3  -13   36
   -3   -3   -1   52
   -3   -3   -1    3

>> B = matrizB(4)
B =

    0    0    1    2
    2    8   -1    0
    4   10   -2   -2
    6   12    0   24

>> Y = inv(A+5*I-B)*(-2*A)*inv(B)
Y =

   -4.864427   12.032899   -9.156829    0.733033
    2.144335   -6.809379    4.997607   -0.326113
   -1.588617   -1.175355    0.665747    0.078104
    0.427488   -0.095344    0.179533   -0.083073
```