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

Control N°3

Grupo : CCOMP5-1
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Alumno :

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1. **(4 pts)** Sean $P = \sum_{k=0}^{n} 3kx^k$, $Q = \sum_{k=1}^{n} x^k$ y $R = (P(x))^2 + (Q(x))^3$ y $[x^k]$ denota al coeficiente del polinomio R que acompaña a x^k, hallar:
   a. $[x^{11}] + [x^8]$ cuando $n = 8$

```
>> P
P =

   24   21   18   15   12    9    6    3    0

>> Q
Q =

   1   1   1   1   1   1   1   1   0
```

```
>> a = conv(P,P)
a =

 Columns 1 through 14:

    576    1008    1305    1476    1530    1476    1323    1080     756

 Columns 15 through 17:

      9       0       0

>> b = conv(Q,Q);
>> b = conv(Q,b)
b =

 Columns 1 through 20:

    1    3    6   10   15   21   28   36   42   46   48   48   46

 Columns 21 through 25:

    3    1    0    0    0
```

```
>> R = [0,0,0,0,0,0,0,0,a] + b
R =

 Columns 1 through 14:

      1      3      6     10     15     21     28     36    618   1054   1353   1524   1576   1518

 Columns 15 through 25:

   1359   1108    777    519    325    186     93     37      9      0      0
```

```
>> 777 + 1518
ans =  2295
```

   b. La suma de coeficientes de R cuando $n = 4$

```
>> P = [12,9,6,3,0]
P =

   12    9    6    3    0

>> Q = [1,1,1,1,0]
Q =

   1   1   1   1   0

>> a = conv(P,P)
a =

   144   216   225   180    90    36     9     0     0

>> b =conv(Q,Q);
>> b = conv(Q,b)
b =

    1    3    6   10   12   12   10    6    3    1    0    0    0

>> R =a+ b
error: operator +: nonconformant arguments (op1 is 1x9, op2 is 1x13)
>> R =[0,0,0,0,a]+ b
R =

     1     3     6    10   156   228   235   186    93    37     9     0     0

>> sum(R)
ans =  964
>> |
```

2. **(3 pts)** Sea $P_t(x)$ un polinomio cuyas raíces son $\{2t-2, 3t-1, 2t+1, 3-t\}$ y $Q_t(x) = [2-t+(t+1)x+(t-1)x^2](e-x^3)$. Si $R_t(x) = P_t(x) + Q_t(x)$, halle: a) Encuentre el valor de:

$$M = \frac{R_5(0.35) + R_{-3}(\sqrt{2})}{R_1(-2)}$$

```
>> P=@(t) poly([2*t-2,3*t-1,2*t+1,3-t]);
>> Q=@(t) conv([(t-1),(t+1),(2-t)],[-1 0 0 exp(1)]);
>> R=@(t) [0 P(t)] + Q(t);
>> M=( polyval(R(5),0)    )
M = -2472.2
>> M=( polyval(R(5),0.35)+polyval(R(-3),sqrt(2)))/polyval(R(1),-2)
M = -45.169
```

3. **(4 pts)** Sea P un polinomio representado en su forma vectorial:

a. Escribir una función que retorne su derivada en forma vectorial

deriv.m

```
function P = deriv(A)
  n = length(A);
  R(1)=0;
  i = n-1;
  for k = 1:n-1
    R(k) = A(k) * i;
    i = i-1;
  endfor
  P = R;
endfunction
```

```
>> polyder([3 4 5 6 7 8])
ans =

   15   16   15   12    7

>> deriv([3 4 5 6 7 8])
ans =

   15   16   15   12    7
```

b. Encuentre $P(\pi)\cdot P(\sqrt{2})$; si P es la tercera derivada del polinomio

$$Q(x) = (x - \pi x^2 + 5)\left(x^3 - \sqrt{5}x + x^2 + e\right) + (1 + 3x^2 + 5x^4 + 7x^6)$$

```
>>
>> Q1 = conv([-pi,1,5],[1,1,-sqrt(5),exp(1)])
Q1 =

  -3.1416   -2.1416   13.0248   -5.7758   -8.4621   13.5914

>> Q2 = [7,0,5,0,3,0,1]
Q2 =

   7   0   5   0   3   0   1

>> length(Q1)
ans =  6
>> length(Q2)
ans =  7
>> Q = [0 Q1] + Q2
Q =

   7.0000   -3.1416    2.8584   13.0248   -2.7758   -8.4621   14.5914
```

```
>> pri = deriv(Q)
pri =

   42.0000   -15.7080    11.4336    39.0744    -5.5516    -8.4621

>> seg = deriv(pri)
seg =

   210.0000    -62.8319     34.3009     78.1489     -5.5516

>> ter = deriv(seg)
ter =

   840.000   -188.496     68.602     78.149

>> P = ter
P =

   840.000   -188.496     68.602     78.149

>> polyval(P,pi)*polyval(P,sqrt(2))
ans =  53217721.83772
```

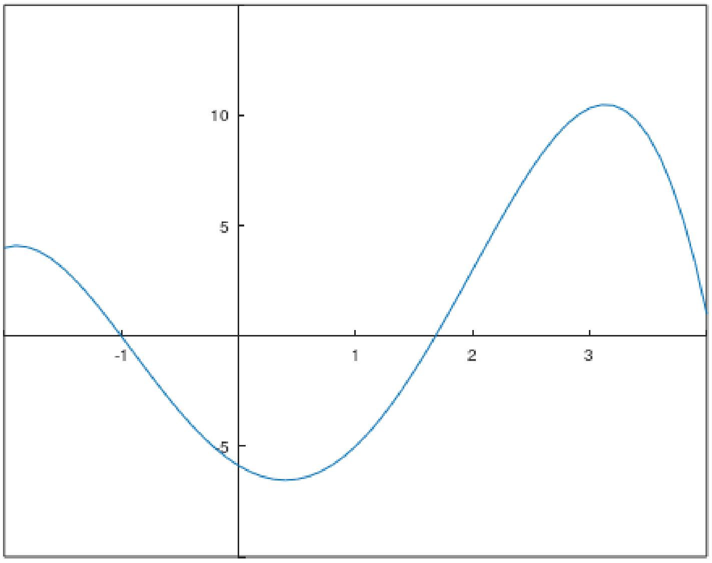
4. **(4 pts)** Sea P el polinomio de Newton que interpola los puntos:

x	-2	-1	1	2	4
y	4	0	-5	3	1

En el intervalo $]-2,4[$, haciendo uso del programa de derivada para polinomios creado, halle:

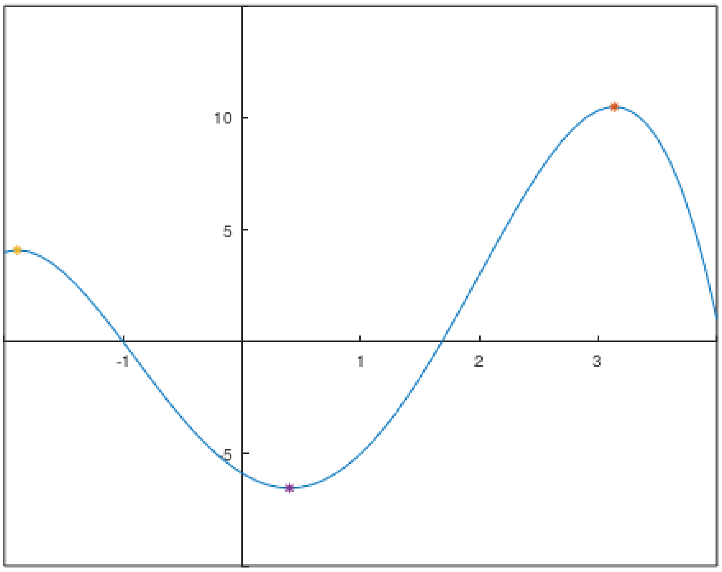
a) El grafico del polinomio.

```
>> tx = [-2,-1,1,2,4];
>> ty = [4,0,-5,3,1];
>> x =-2:0.1:4;
>> P = newtonp(tx,ty)
P =

  -0.34167    0.75000    3.70833   -3.25000   -5.86667

>> y = polyval(P,x);
>> plot(x,y)
>> set(gca,"yaxislocation","origin")
>> set(gca,"xaxislocation","origin")
>>
```



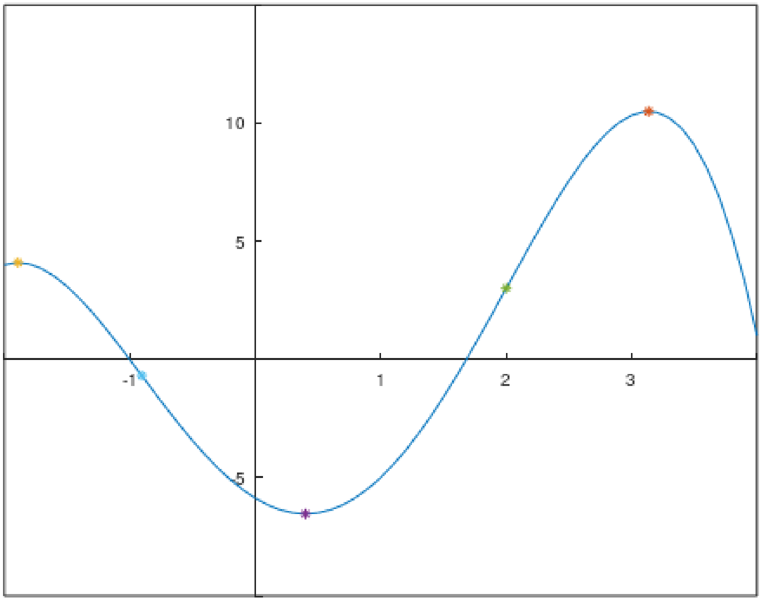
b) Las coordenadas del punto máximo y mínimo en el intervalo señalado. Añadir dichos puntos al gráfico.

```
>> Pd = polyder(P)
Pd =

  -1.3667    2.2500    7.4167   -3.2500

>> raices = roots(Pd)
raices =

   3.13530
  -1.89023
   0.40126

>> yes   = polyval(P,raices)
yes =

   10.4966
    4.0993
   -6.5341

>> puntos = [raices,yes]
puntos =

    3.13530   10.49658
   -1.89023    4.09929
    0.40126   -6.53409

>> hold on
>> plot(3.13530,10.49658,"*")
>> plot(-1.89023,4.09929,"*")
>> plot(0.40126,-6.53409,"*")
>>
```



c) Las coordenadas de los puntos de inflexión en el intervalo señalado. Añadir dichos puntos al gráfico.

```
>> Pdd = polyder(Pd)
Pdd =

  -4.1000    4.5000    7.4167

>> raicesd = roots(Pdd)
raicesd =

   2.00140
  -0.90384

>> yes = polyval(P,raicesd)
yes =

   3.01351
  -0.68155

>> puntos  = [raicesd,yes]
puntos =

   2.00140   3.01351
  -0.90384  -0.68155

>> plot(2.0014,3.0135,"*")
>> plot(-0.9038,-0.6816,"*")
>> |
```



5. **(5 pts)** Dados los puntos:

x	-2	-1	1	3	4
y	-2	0	4	2	-1

Sea P el polinomio que interpola los pares ordenados haciendo uso del método de Newton.

x	-3	-2	0	2	3
y	3	1	-1	3	7

Sea Q el polinomio que interpola los pares ordenados haciendo uso del método de Lagrange.

Encuentre la siguiente integral:

$$\int_{-\sqrt{3}}^{1}\int_{1}^{4} P(x).Q(y)\,dxdy$$

```
>> x5n = [-2 -1 1 3 4]
x5n =

  -2  -1   1   3   4

>> y5n = [-2 0 4 2 -1]
y5n =

  -2   0   4   2  -1

>> x5l = [-3 -2 0 2 3]
x5l =

  -3  -2   0   2   3

>> y5l = [3 1 -1 3 7]
y5l =

   3   1  -1   3   7

>> P = newtonp(x5n,y5n)
P =

   0.027778  -0.177778  -0.494444   2.177778   2.466667

>> Q = lagrange(x5l,y5l)
Q =

  -0.016667   0.033333   0.816667   0.366667  -1.000000
```

```
>> Pint = polyint(P)
Pint =

   0.00556  -0.04444  -0.16481   1.08889   2.46667   0.00000

>> Qint = polyint(Q)
Qint =

  -0.00333   0.00833   0.27222   0.18333  -1.00000   0.00000

>> f1 = polyval(Pint,4)-polyval(Pint,1)
f1 =  7.7000
>> f1 = polyval(Qint,1)-polyval(Qint,-sqrt(3))
f1 = -1.5339
>> f1 = polyval(Pint,4)-polyval(Pint,1)
f1 =  7.7000
>> f2 = polyval(Qint,1)-polyval(Qint,-sqrt(3))
f2 = -1.5339
>> res = f1*f2
res = -11.811
```