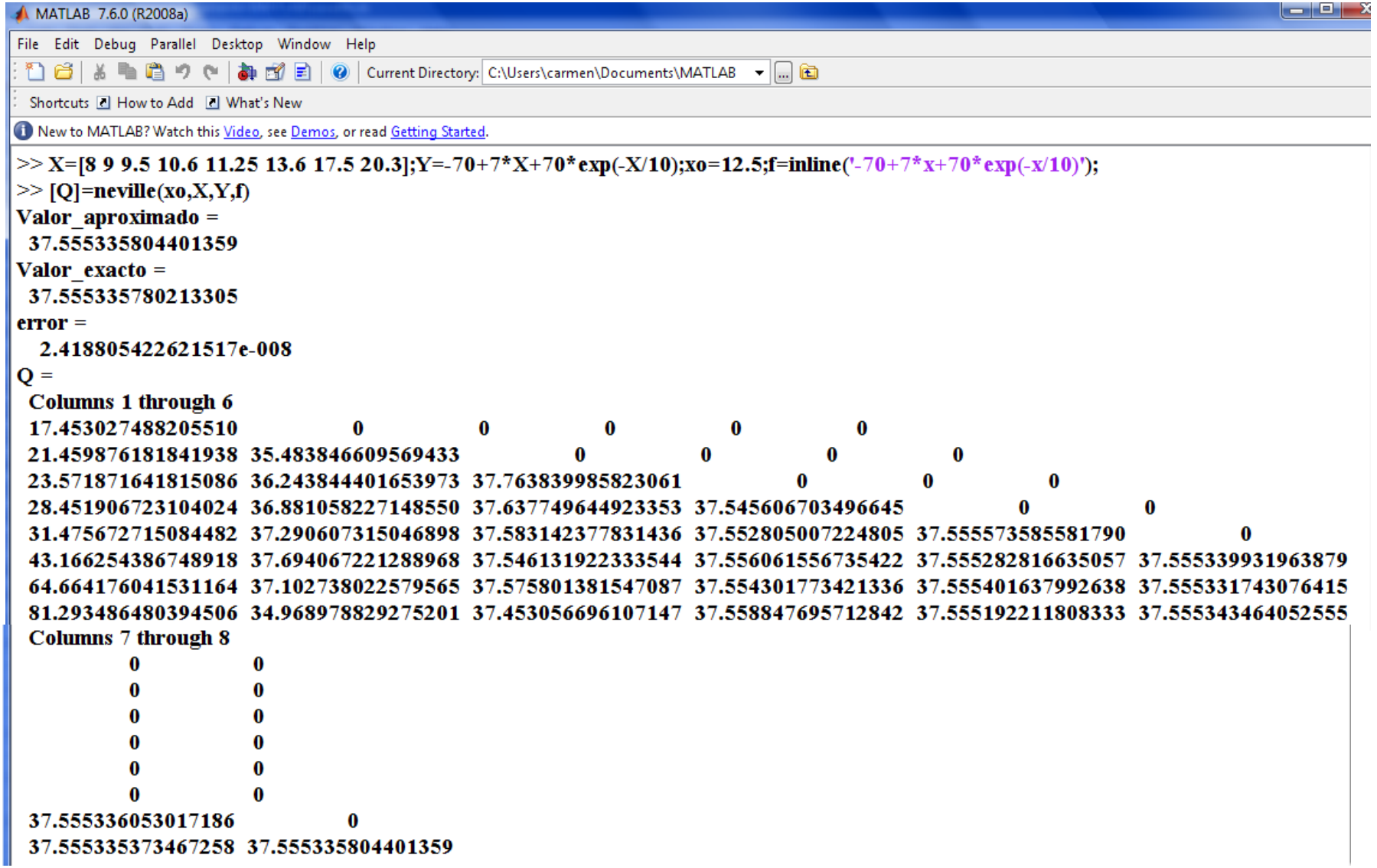
INTERPOLACIÓN MEDIANTE POLINOMIO DE LAGRANGE

Dados los valores de x: -1.5, -1.2, -0.8, -0.7, -0.55, -0.25, -0.15, y la función $f_{(x)}=\log_7(5-3x)$, aproxime el valor de $\log_7(7.25)$, empleando un POLINOMIO DE LAGRANGE de mayor grado posible. Además obtenga el valor exacto y compárelo con el valor aproximado. UTILICE QUINCE DECIMALES.

```
>> xo=-1.5;x1=-1.2;x2=-0.8;x3=-0.7;x4=-0.55;x5=-0.25;x6=-0.15;t=-0.75;f=inline('log(5-3*x)/log(7)');syms x

>> lo=((x-x1)*(x-x2)*(x-x3)*(x-x4)*(x-x5)*(x-x6))/((xo-x1)*(xo-x2)*(xo-x3)*(xo-x4)*(xo-x5)*(xo-x6));

>> l1=((x-xo)*(x-x2)*(x-x3)*(x-x4)*(x-x5)*(x-x6))/((x1-xo)*(x1-x2)*(x1-x3)*(x1-x4)*(x1-x5)*(x1-x6));

>> l2=((x-xo)*(x-x1)*(x-x3)*(x-x4)*(x-x5)*(x-x6))/((x2-xo)*(x2-x1)*(x2-x3)*(x2-x4)*(x2-x5)*(x2-x6));

>> l3=((x-xo)*(x-x1)*(x-x2)*(x-x4)*(x-x5)*(x-x6))/((x3-xo)*(x3-x1)*(x3-x2)*(x3-x4)*(x3-x5)*(x3-x6));

>> l4=((x-xo)*(x-x1)*(x-x2)*(x-x3)*(x-x5)*(x-x6))/((x4-xo)*(x4-x1)*(x4-x2)*(x4-x3)*(x4-x5)*(x4-x6));

>> l5=((x-xo)*(x-x1)*(x-x2)*(x-x3)*(x-x4)*(x-x6))/((x5-xo)*(x5-x1)*(x5-x2)*(x5-x3)*(x5-x4)*(x5-x6));

>> l6=((x-xo)*(x-x1)*(x-x2)*(x-x3)*(x-x4)*(x-x5))/((x6-xo)*(x6-x1)*(x6-x2)*(x6-x3)*(x6-x4)*(x6-x5));

>>
F=subs(f,xo)*subs(lo,t)+subs(f,x1)*subs(l1,t)+subs(f,x2)*subs(l2,t)+subs(f,x3)*subs(l3,t)+subs(f,x4)*subs(l4,t)
+subs(f,x5)*subs(l5,t)+subs(f,x6)*subs(l6,t)

F =   1.018033379882052

>> Valor_exacto=subs(f,t)   =   1.018033371082578

>> error=abs(Valor_exacto-F)   =    8.799474038312383e-009
```

INTERPOLACIÓN MEDIANTE NEVILLE

La distancia D(t) recorrida por un automóvil se establece mediante la siguiente ecuación: $D(t)= -70 + 7t + 70e^{-t/10}$, considerando los siguientes valores de t: 8.0, 9.0, 9.5, 10.6, 11.25, 13.6, 17.5, 20.3. Determine el valor aproximado de la distancia recorrida en t = 12.5, empleando el MÉTODO DE NEVILLE. EMPLEE QUINCE DECIMALES. Además el valor exacto de la distancia en t = 12.5.



INTERPOLACIÓN MEDIANTE DIFERENCIAS DIVIDIDAS

Dados los valores de x: –1.98, –1.79, –1.55, –1.25, –0.65, –0.42, –0.35, –0.15, y la función $f_{(x)}= 18^{-x^2/25}$, aproxime el valor de $18^{-0.0225}$, empleando el MÉTODO DE DIFERENCIAS DIVIDIDAS. Además obtenga el valor exacto y determine el error de aproximación. UTILICE QUINCE DECIMALES.

```
>> X=[-1.98 -1.79 -1.55 -1.25 -0.65 -0.42 -0.35 -0.15];Y=18.^(-X.^2/25);xo=-0.75; diferencias(X,Y,xo)
introduzca la funcion:  18^(-x^2/25)
P =
1087531942122258067/90071992547409920+520277603823063/18014398509481984*x+(-3168930697555963/144115188075855872*x -
3137241390580403 37/720575940379279 3600)*(x+179/100)+(-7289706259963611/288230376151711744*x-
72168091973639 7489/1441151880758558 7200)*(x+179/100)*(x+31/20)+
(5664977055530273/9223372036854775808*x+56083272849749 7027/4611686018427387 90400)*(x+179/100)*(x+31/20)*(x+5/4)+(2765442
921203059/230584300921369 3952*x+27377884991991028 41/11529215046068469 7600)*(x+179/100)*(x+31/20)*(x+5/4)*(x+13/20)+(-
1520957636792005/36893488147419103232*x-
3011496120848169 9/3689348814741910 32320)*(x+179/100)*(x+31/20)*(x+5/4)*(x+13/20)*(x+21/50)+(-
5845347863892895/14757395258967641 2928*x-
1157378877050793 21/14757395258967641 29280)*(x+179/100)*(x+31/20)*(x+5/4)*(x+13/20)*(x+21/50)*(x+7/20)
valor_aproximado =  0.937036193794524   valor_exacto =  0.937036199062235    error =  5.267710823098e-009

  0.635555068947885                   0                   0                   0                   0
  0.690429365569197   0.288812087480585                   0                   0                   0
  0.757475014778142   0.279356871703940  -0.021988873899176                   0                   0
  0.834728935591491   0.257513069377830  -0.040451485789091  -0.025291249164268                   0
  0.952326555325923   0.195996032890720  -0.068352262763456  -0.024474365766987   0.000614198043069
  0.979812097326218   0.119502356523021  -0.092161055864698  -0.021069728408179   0.002485136758254
  0.985936999339895   0.087498600195378  -0.106679187758810  -0.016131257660124   0.004115392290046
  0.997402045956758   0.057325233084317  -0.111753211522446  -0.010148047527273   0.005439281938955
                  0                   0                   0
                  0                   0                   0
                  0                   0                   0
                  0                   0                   0
                  0                   0                   0
  0.001199319689221                   0                   0
  0.001132121897078  -0.000041225639352                   0
  0.000945635463507  -0.000113711239983  -0.000039609617831
```

INTERPOLACIÓN MEDIANTE HERMITE

La distancia $D_{(t)}$ recorrida por un automóvil se establece mediante la siguiente ecuación: $D_{(t)} = 3te^t - \cos(t)$, considerando los siguientes valores de t: 0.9, 1.25, 1.75, 1.92, 2.85, 3.5, 4.8, aproxime el valor de la distancia cuando el tiempo es igual a 3.15, empleando el MÉTODO DE HERMITE mediante diferencias. Además obtenga el valor exacto y determine el error de aproximación. UTILICE QUINCE DECIMALES.

```
>> X=[0.9,0.9,1.25,1.25,1.75,1.75,1.92,1.92,2.85,2.85,3.5,3.5,4.8,4.8];Y=3*X.*exp(X)-cos(X);xo=3.15;syms t

>> g=3*t*exp(t)-cos(t);Z=subs(diff(g,t),t,[0.9,1.25,1.75,1.92,2.85,3.5,4.8]);[D]=hermite(X,Y,Z,xo)

P =

-
4111471065415347/562949953421312+4166692275697275/281474976710656*x+1807267728423163/140737488355328*(x-
9/10)^2+6587647220331595/1125899906842624*(x-9/10)^2*(x-5/4)+4941709377257275/2251799813685248*(x-9/10)^2*(x-
5/4)^2+5337381038506353/9007199254740992*(x-9/10)^2*(x-5/4)^2*(x-7/4)+4509532086297223/36028797018963968*(x-
9/10)^2*(x-5/4)^2*(x-7/4)^2+6228375189766643/28823037615171744*(x-9/10)^2*(x-5/4)^2*(x-7/4)^2*(x-
48/25)+8424841566022481/2305843009213693952*(x-9/10)^2*(x-5/4)^2*(x-7/4)^2*(x-
48/25)^2+298362626778057/576460752303423488*(x-9/10)^2*(x-5/4)^2*(x-7/4)^2*(x-48/25)^2*(x-
57/20)+2489981647129129/36893488147419103232*(x-9/10)^2*(x-5/4)^2*(x-7/4)^2*(x-48/25)^2*(x-
57/20)^2+4542705102153677/590295810358705651712*(x-9/10)^2*(x-5/4)^2*(x-7/4)^2*(x-48/25)^2*(x-57/20)^2*(x-
7/2)+8380999532812989/9444732965739290427392*(x-9/10)^2*(x-5/4)^2*(x-7/4)^2*(x-48/25)^2*(x-57/20)^2*(x-
7/2)^2+3382133104118629/37778931862957161709568*(x-9/10)^2*(x-5/4)^2*(x-7/4)^2*(x-48/25)^2*(x-57/20)^2*(x-7/2)^2*(x-
24/5)

valor_aproximado =    2.215257749368356e+002

valor_exacto =    2.215257749483800e+002

error =    1.154432993644150e-008
```

D = 1.0e+003 *

Columns 1 through 7

0.006019318431853	0	0	0	0	0	0
0.006019318431853	0.014803064643222	0	0	0	0	0
0.012773463728087	0.019297557989239	0.012841409560047	0	0	0	0
0.012773463728087	0.024508799582223	0.014889261694241	0.005851006097696	0	0	0
0.030389910104680	0.035232892753186	0.021448186341926	0.007716381938453	0.002194559812655	0	0
0.030389910104680	0.048459458023921	0.026453130541471	0.010009888399090	0.002698242894867	0.000592568332015	0
0.039630870434266	0.054358590174036	0.034700777353614	0.012309920615139	0.003432883904551	0.000720236284003	0.000125164658812
0.039630870434266	0.060691241664672	0.037250891121393	0.015000669222229	0.004016042697149	0.000870386257609	0.000147205856476
0.148768321974406	0.117352098430259	0.060925652436115	0.021522510286111	0.005928946421711	0.001195564827851	0.000203236606401
0.148768321974406	0.199961358270899	0.088827161118968	0.030001622239627	0.007708283594105	0.001617579247631	0.000263759012362
0.348648702253560	0.307508277352544	0.165456798587147	0.048499770549480	0.011707688803705	0.002285374405485	0.000381597233060
0.348648702253560	0.446707818214657	0.214153139787865	0.074917448001106	0.016720049020016	0.003172379883741	0.000506860273289
1.749662513286342	1.077702931563679	0.485380856422325	0.139091136735620	0.032909583966418	0.005621366300834	0.000850342505935
1.749662513286342	2.113285100217150	0.796601668194978	0.239400624440503	0.051440762925581	0.009503168697007	0.001347848054227

Columns 8 through 14

0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0.000021609017318	0	0	0	0	0	0
0.000028733717910	0.000003653692611	0	0	0	0	0
0.000037826503726	0.000004662967085	0.000000517576653	0	0	0	0
0.000052372542532	0.000006464906136	0.000000693053481	0.000000067491088	0	0	0
0.000071578880131	0.000008536150044	0.000000920552848	0.000000087499756	0.000000007695642	0	0
0.000112617125458	0.000013455162402	0.000001385637284	0.000000131009700	0.000000011156396	0.000000000887373	0
0.000172744982046	0.000019714051340	0.000002052094734	0.000000187734493	0.000000015978815	0.000000001236518	0.000000000089524

INTERPOLACIÓN MEDIANTE TRAZADOR CÚBICO

En un experimento se ha medido el coeficiente de compresibilidad del oxígeno líquido a distintas temperaturas:

T, °K	60	65	70	75	80	85	90
χ, atm^{-1}	$0.95x10^{-4}$	$1.06x10^{-4}$	$1.20x10^{-4}$	$1.35x10^{-4}$	$1.54x10^{-4}$	$1.78x10^{-4}$	$2.06x10^{-4}$

Aproxime el coeficiente de compresibilidad del oxígeno líquido a una temperatura de –300.82°F, empleando el Método de TRAZADOR CÚBICO LIBRE. UTILICE NUEVE DECIMALES.

```
>> ho=5;h1=ho;h2=h1;h3=h2;h4=h3;h5=h4;ao=0.95e-4;a1=1.06e-4;a2=1.2e-4;a3=1.35e-4;a4=1.54e-4;a5=1.78e-4;a6=2.06e-4;
ho*c0+2*(ho+h1)*c1+h1*c2  = 3*(a2-a1)/h1-3*(a1-ao)/ho
 h1*c1+2*(h1+h2)*c2+h2*c3= 3*(a3-a2)/h2-3*(a2-a1)/h1
h2*c2+2*(h2+h3)*c3+h3*c4 = 3*(a4-a3)/h3-3*(a3-a2)/h2
h3*c3+2*(h3+h4)*c4+h4*c5 = 3*(a5-a4)/h4-3*(a4-a3)/h3
h4*c4+2*(h4+h5)*c5+h5*c6 = 3*(a6-a5)/h5-3*(a5-a4)/h4
5*c0+20*c1+5*c2 =    1.800000000000003e-006
5*c1+20*c2+5*c3 =    5.999999999999976e-007
5*c2+20*c3+5*c4 =    2.400000000000002e-006
5*c3+20*c4+5*c5 =    2.999999999999992e-006
5*c4+20*c5+5*c6 =    2.400000000000009e-006
>> [c0 c1 c2 c3 c4 c5 c6]=solve('c0=0','5*c0+20*c1+5*c2=1.800000000000003e-
006','5*c1+20*c2+5*c3=5.999999999999976e-007','5*c2+20*c3+5*c4=2.400000000000002e-
006','5*c3+20*c4+5*c5=2.999999999999992e-006','5*c4+20*c5+5*c6=2.400000000000009e-006','c6=0')
 c0 = 0.
 c1 = .946153846153848288205128205128205128205128205128e-7
 c2 =  -.184615384615387152820512820512820512820512820512e-7
 c3 =  .992307692307695523076923076923076923076923076923e-7
 c4 =  .101538461538460906051282051282051282051282051282e-6
 c5 =  .946153846153852234871794871794871794871794871794e-7
 c6 = 0.
 d5=(c6-c5)/(3*h5) =  -.630769230769234823247863247863247863247863247863e-8
 b5=(a6-a5)/h5-(h5/3)*(2*c5+c6) =  .528461538461538318199844185533184199844185533184e-5
 S=a5+b5*(x-85)+c5*(x-85)^2+d5*(x-85)^3;
Coeficiente_de_compresibilidad=subs(S,x,88.25)  =    1.959578437500000e-004
```