Name-Surname:

Id & Signature:

MATH 317- Homework I

Instructions: All questions are equally weighted. You may edit this file. When you finish, create a pdf file. You are free to use small pictures, screenshots (zoomed), handwriting or equation editor etc.

Question 1. Use Excel and the bisection method to approximate to solution of

$$x\cos x - 2x^2 + 3x - 1 = 0$$

on the interval [0.2,0. 3].

Solution:

E26

	A	B	C	D	E	F	G	H	I	J	K	L
2		f(x)=xcosx-2x^2+3x-1			interval [0.2,0.3]							
3												
4												
5		inintial_int	final_int	mid_value	f(a)	f(b)	f©	error	stop_criteria			
6		0.2	0.3	0.25	-0.28399	0.006601	-0.13277	0.1	1			
7		0.25	0.3	0.275	-0.13277	0.006601	-0.06158	0.05	1			
8		0.275	0.3	0.2875	-0.06158	0.006601	-0.02711	0.025	1			
9		0.2875	0.3	0.29375	-0.02711	0.006601	-0.01016	0.0125	1			
10		0.29375	0.3	0.296875	-0.01016	0.006601	-0.00176	0.00625	1			
11		0.296875	0.3	0.298438	-0.00176	0.006601	0.002428	0.003125	1			
12		0.296875	0.298438	0.297656	-0.00176	0.002428	0.000338	0.001563	1			
13		0.296875	0.297656	0.297266	-0.00176	0.000338	-0.00071	0.000781	1			
14		0.297266	0.297656	0.297461	-0.00071	0.000338	-0.00019	0.000391	1			
15		0.297461	0.297656	0.297559	-0.00019	0.000338	7.6E-05	0.000195	1			
16		0.297461	0.297559	0.29751	-0.00019	7.6E-05	-5.5E-05	9.77E-05	1			
17		0.29751	0.297559	0.297534	-5.5E-05	7.6E-05	1.06E-05	4.88E-05	1			
18		0.29751	0.297534	0.297522	-5.5E-05	1.06E-05	-2.2E-05	2.44E-05	1			
19		0.297522	0.297534	0.297528	-2.2E-05	1.06E-05	-5.8E-06	1.22E-05	1			
20		0.297528	0.297534	0.297531	-5.8E-06	1.06E-05	2.4E-06	6.1E-06	1			
21		0.297528	0.297531	0.29753	-5.8E-06	2.4E-06	-1.7E-06	3.05E-06	1			
22		0.29753	0.297531	0.29753	-1.7E-06	2.4E-06	3.52E-07	1.53E-06	1			
23		0.29753	0.29753	0.29753	-1.7E-06	3.52E-07	-6.7E-07	7.63E-07	2			
24												
25			ANS=0.29753									
26												

Question 2. The surface of many airfoils can be described with an equation of the form

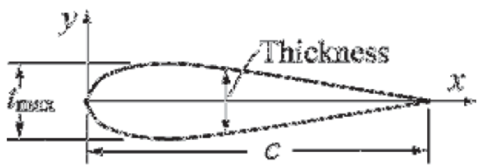
$$y = \pm \frac{tc}{0.2}\left[a_0\sqrt{\frac{x}{c}} + \frac{a_1 x}{c} + a_2\left(\frac{x}{c}\right)^2 + a_3\left(\frac{x}{c}\right)^3 + a_4\left(\frac{x}{c}\right)^4\right]$$

Where t is the maximum thickness as a fraction of the chord length ($t_{max} = ct$).

Given that c=1 m and t=0.2 m, the following values for y have been measured for a particular airfoil:

X (m)	0.15	0.35	0.5	0.7	0.85
Y(m)	0.08909	0.09914	0.08823	0.06107	0.03421

Determine the constants a_0, a_1, a_2, a_3 and a_4 by using the MINVERSE function of Excel. (Write a system of five equations and five unknowns and use Excel to solve the system.)



Solution:

C1 | fx | system of equations

	A	B	C	D	E	F	G	H	I	J
1			system of equations							
2										
3										
4	x	y								
5	0.15	0.08909		0.08909=sqrt(0.15)a0+0.15a1+0.15^2a2+0.15^3a3+0.15^4a4						
6	0.35	0.09914		0.09914=sqrt(0.35)a0+0.35a1+0.35^2a2+0.35^3a3+0.35^4a4						
7	0.5	0.08823		0.08823=sqrt(0.5)a0+0.5a1+0.5^2a2+0.5^3a3+0.5^4a4						
8	0.7	0.06107		0.06107=sqrt(0.7)a0+0.7a1+0.7^2a2+0.7^3a3+0.7^4a4						
9	0.85	0.03421		0.03421=sqrt(0.85)a0+0.85a1+0.85^2a2+0.85^3a3+0.85^4a4						
10										
11										
12		A						b		
13		0.387298	0.15	0.0225	0.003375	0.000506		0.08909		
14		0.591608	0.35	0.1225	0.042875	0.015006		0.09914		
15		0.707107	0.5	0.25	0.015625	0.003906		0.08823		
16		0.83666	0.7	0.49	0.343	0.2401		0.06107		
17		0.921954	0.85	0.7225	0.614125	0.522006		0.03421		
18										

20	A^-1						a's solutions	
21	12.63063	-10.7621	0.944405	3.732199	-1.42659		0.320755	
22	-29.4701	33.18761	-3.55166	-11.8279	4.541458		-0.2156	
23	23.13343	-36.0754	9.093633	12.31233	-4.71656		-0.12266	
24	4.100657	-2.10347	-11.9936	19.39448	-8.77437		-0.01716	
25	-11.1637	17.37326	5.639092	-27.1902	13.89119		0.040059	
26								
27	ANS	a0=0.320755						
28		a1=-0.2156						
29		a2=-012266						
30		a3=-0.01716						
31		a4=0.040059						

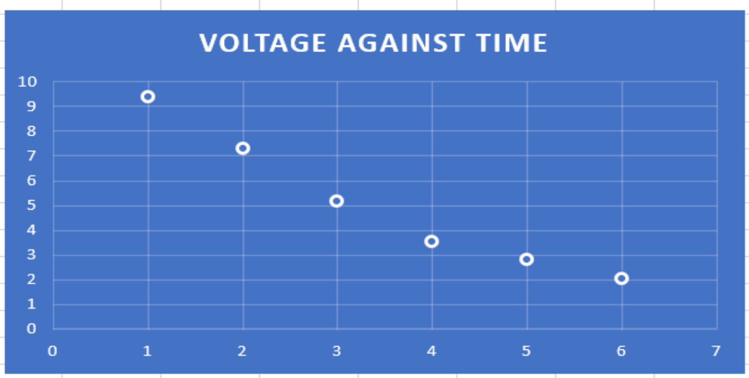
<u>Question 3.</u> Plot the voltage as a function of time and use Newton's divided difference method to compute the voltage at t=3.145 sec from the following experimental data:

t(sec)	1	2	3	4	5	6
V(Volt)	9.4	7.31	5.15	3.55	2.81	2.04

<u>Solution:</u>

C28 {=C20+D20*(3.145-B20)+E20*(3.145-B20)*(3.145-B21)+F20*(3.145-B20)*(3.145-B21)*(3.145-

	A	B	C	D	E	F	G	H
1								
2		t	V					
3		1	9.4					
4		2	7.31					
5		3	5.15					
6		4	3.55					
7		5	2.81					
8		6	2.04					



	A	B	C	D	E	F	G	H
19		t	V	f1	f2	f3	f4	f5
20		1	9.4	-2.09	-0.035	0.105	-0.01375	-0.00717
21		2	7.31	-2.16	0.28	0.05	-0.04958	
22		3	5.15	-1.6	0.43	-0.14833		
23		4	3.55	-0.74	-0.015			
24		5	2.81	-0.77				
25		6	2.04					
26								
27								
28		V(3.145)	4.868521					

Question 4: The boiling temperature of water T_B at various altitudes h is given in the following table.

h(ft)	-1,000	0	3,000	8,000	15,000	22,000	28,000
T (F)	213.9	212	206.2	196.2	184.4	172.6	163.1

(a) Compute the straight-line equation $T_B = mh + b$ that best fits the data.

Solution:

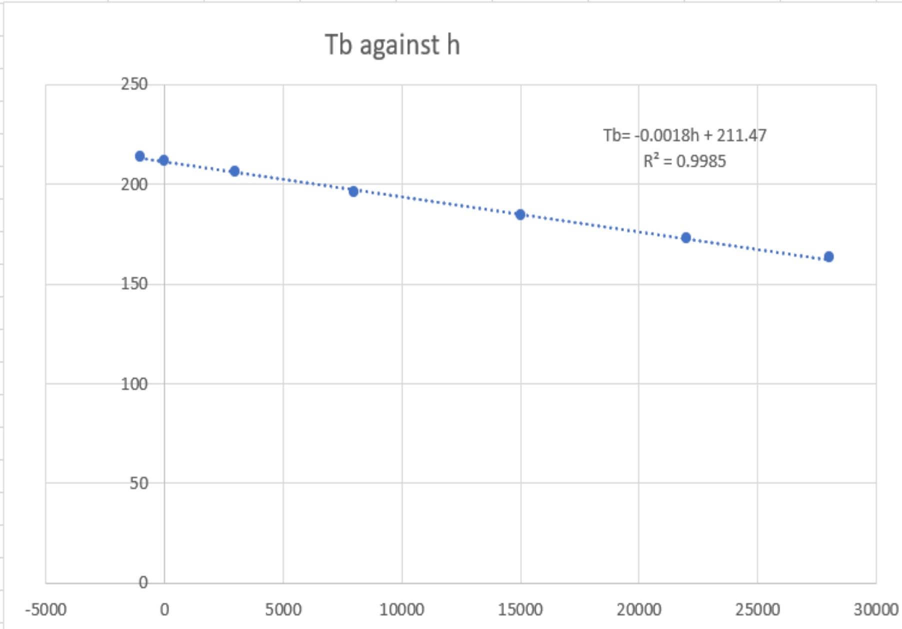
A2 | fx ANS

	A	B	C	D	E
1					
2	ANS				
3		Tb=mh+b			
4					
5		nb+mSum(h)=Sum(Tb)			
6		bSum(h)+mSum(h^2)=Sum(h*Tb)			
7					
8		h	Tb	h^2	hTb
9		-1000	213.9	1000000	-213900
10		0	212	0	0
11		3000	206.2	9000000	618600
12		8000	196.2	64000000	1569600
13		15000	184.4	225000000	2766000
14		22000	172.6	484000000	3797200
15		28000	163.1	784000000	4566800
16	Total	75000	1348.4	1567000000	13104300
17					
18					
19		m	-0.0018		
20		b	1367.25		
21					
22		Tb=-0.0018h+1367.25			
23					

(b) Use Excel's Add Trendline feature to find the straight line that best fits the given data.

Solution

24	ANS		
25		h	Tb
26		-1000	213.9
27		0	212
28		3000	206.2
29		8000	196.2
30		15000	184.4
31		22000	172.6
32		28000	163.1
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45		equation from excel trendline function	
46			
47		Tb=-0.0018h+211.47	
48			



(c) Use this linear equation for calculating the boiling temperature at 5,000 ft.

Solution

44			
45		equation from excel trendline function	
46			
47		Tb=-0.0018h+211.47	
48			
49	ANS	m=-0.0018	
50			
51		b=211.47	
52			
53		h=5000	
54			
55		Tb	202.47
56			

THE END

THANK YOU!!!