Mansoura University
Faculty of Engineering

Quiz 1 (G2)
Monday 17/10/2016

Biomedical Engineering Programs

Prof. Dr. Magdi S. El-Azab | Numerical Analysis (MTH 201) | Time allowed: 30 min.

Name:

Given the table of readings:

x	1.0	1.5	2.0	2.5	3
y	0.12	0.52	1.47	3.24	6.21

1. **[5 pts]** Fit these readings for the curve $y = ax^b$.
2. **[5 pts]** By the use of two different interpolation formulas, find $y(1.25)$ and $y(2.25)$.

1.

x	y	X=lnx	Y=lny	x^2	xY	y approx	dy2
1	0.12	0	-2.12026	0	0	0.12069	4.8E-07
1.5	0.52	0.40547	-0.65393	0.1644	-0.26514	0.51795	4.2E-06
2	1.47	0.69315	0.38526	0.48045	0.26704	1.45591	0.0002
2.5	3.24	0.91629	1.17557	0.83959	1.07717	3.24553	3.1E-05
3	6.21	1.09861	1.82616	1.20695	2.00624	6.24805	0.00145
		3.11352	0.61281	2.69139	3.08531		0.00168

2.69139 b + 3.11352 A = 3.08531
3.11352 b + 5 A = 0.61281

b = 3.5925096 A = -2.114505 a = 0.120693 Error = 0.041008

y = 0.120693(x^3.5926)

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Newton general forward formula

x	y	Δ	Δ2	Δ3	Δ4
1	0.12				
		0.8			
1.5	0.52		1.1		
		1.9		0.36	
2	1.47		1.64		0.0733333
		3.54		0.5066667	
2.5	3.24		2.4		
		5.94			
3	6.21				

x0 =	1	x =	1.25	y (	1.25	) =	0.263828
x0 =	1	x =	2.25	y (	2.25	) =	2.231328

x	y	Δ	Δ2	Δ3	Δ4
1	0.12				
		0.4			
1.5	0.52		0.55		
		0.95		0.27	
2	1.47		0.82		0.11
		1.77		0.38	
2.5	3.24		1.2		
		2.97			
3	6.21				

Newton forward formula

x0 = 1 h = 0.5 x = 1.25 s = 0.5

y (1.25) =

three terms 0.25125

four terms 0.268125

five terms 0.2469531

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Gauss forward formula

x0 =	**2**	**h =**	**0.5**	**x =**	2.25	s =	0.5

y (2.25) =

three terms	2.2525
four terms	2.20125
five terms	2.2204688

Lagrang's interpolation formula (five points)

x	1	1.5	2	2.5	3
y	0.12	0.52	1.47	3.24	6.21

	l0 =	l1 =	l2 =	l3 =	l4 =
l (x) =	0.2734375	1.09375	-0.546875	0.21875	-0.039063
	0.0234375	-0.15625	0.703125	0.46875	-0.039063

x = 1.25 y (1.25) =

three terms	-0.20234375
four terms	0.50640625
five terms	0.263828125

x = 2.25 y (2.25) =

three terms	0.95515625
four terms	2.47390625
five terms	2.231328125