

**Question 1**

$$f(x) = 3.25 \sin(x^2) - 1.25e^{0.5x}$$

iter	$x_l$	$x_r$	$x_u$	$f(x_l)$	$f(x_r)$	$f(x_u)$	$\epsilon_a$	$E_a$
1	-2.2	-1.85	-1.5	-3.63966	-1.39665	1.93828		
2	-1.85	-1.675	-1.5	-1.39665	0.53048	1.93828	0.104478	0.175
3	-1.85	-1.7625	-1.675	-1.39665	-0.4035	0.53048	0.049645	0.0875
4	-1.7625	-1.71875	-1.675	-0.4035	0.076499	0.53048	0.025455	0.04375

**Question 2**

$$6x + y - 3z = 16.6$$

$$x + 7y + 4z = 27.5$$

$$3x - 2y + 8z = 18.2$$

6	1	-3	16.6
1	7	4	27.5
3	-2	8	18.2

x	y	z	$\epsilon_x$	$\epsilon_y$	$\epsilon_z$	$E_x$	$E_y$	$E_z$
0	0	0						
2.766667	3.533333	2.120833	1	1	1	2.766667	3.533333	2.120833
3.238194	2.254067	1.624194	0.145614	0.567537	0.305776	0.471528	1.279266	0.496639
3.203086	2.542877	1.709562	0.010961	0.113576	0.049936	0.035109	0.288809	0.085368

**Question 3**

-3	24
0	-12
1	-8

$$L_0 = \frac{(x - x_1)(x - x_2)}{(x_0 - x_1)(x_0 - x_2)} = \frac{(x - 0)(x - 1)}{(-3 - 0)(-3 - 1)} = \frac{x^2 - x}{12}$$

$$L_1 = \frac{(x - x_0)(x - x_2)}{(x_1 - x_0)(x_1 - x_2)} = \frac{(x + 3)(x - 1)}{(0 + 3)(0 - 1)} = \frac{x^2 + 2x - 3}{-3}$$

$$L_2 = \frac{(x - x_0)(x - x_1)}{(x_2 - x_0)(x_2 - x_1)} = \frac{(x + 3)(x - 0)}{(1 + 3)(1 - 0)} = \frac{x^2 + 3x}{4}$$

$$f_2(x) = L_0f(x_0) + L_1f(x_1) + L_2f(x_2)$$

$$f_2(x) = \frac{x^2 - x}{12} \times 24 + \frac{x^2 + 2x - 3}{-3} \times (-12) + \frac{x^2 + 3x}{4} \times (-8)$$

$$f_2(x) = (x^2 - x) \times 2 + (x^2 + 2x - 3) \times 4 + (x^2 + 3x) \times (-2)$$

$$f_2(x) = 2x^2 - 2x + 4x^2 + 8x - 12 - 2x^2 - 6x$$

$$f_2(x) = 4x^2 - 12$$

**Question 4**

x	y	xy	x <sup>2</sup>	SSE
2.2	0.8	1.76	4.84	0.00053
2.7	1.9	5.13	7.29	0.010987
3.5	4.1	14.35	12.25	0.017066
3.7	4.5	16.65	13.69	0.00156
4.2	5.6	23.52	17.64	0.007803
16.3	16.9	61.41	55.71	0.037947

A=	2.455677
B=	-4.62551

**Question 5**

$$\int_{-3}^6 (3x + 5) \cos(0.25x) dx$$

n= 6  
h= 1.5

$$I = (12x + 20) \sin(0.25x) + 48\cos(0.25x)$$

	x	f(x)
a=x <sub>0</sub> =	-3	-2.92676
x <sub>1</sub> =	-1.5	0.465254
x <sub>2</sub> =	0	5
x <sub>3</sub> =	1.5	8.839822
x <sub>4</sub> =	3	10.24364
x <sub>5</sub> =	4.5	7.976766
b=x <sub>6</sub> =	6	1.626956

$$I = \frac{h}{3} [f(x_0) + 4 \sum_{i=1,3,5}^{n-1} f(x_i) + 2 \sum_{i=2,4,6}^{n-2} f(x_i) + f(x_n)]$$

I= 49.15743

true= 49.13764

E<sub>t</sub>= 0.019789

ε<sub>t</sub>= 0.000403

**Question 6**

$$x \frac{dy}{dx} = 3x + 2y$$

$$y(2) = 2$$

$$y = x^2 - 3x$$

h= 0.2

iter	x	y	K1	y <sup>0</sup>	K2	true value	Et	εt
0	2	-2	1	-1.8	1.363636	-2		
1	2.2	-1.76364	1.396694	-1.4843	1.763085	-1.76	0.003636	0.002066
2	2.4	-1.44766	1.793618	-1.08893	2.162358	-1.44	0.007658	0.005318

### Question 7

A)

$$\varepsilon_a = \frac{0.0034}{0.759} = 0.00447 \quad 0.447 \times 10^{-2} < 0.5 \times 10^{-d} \quad d = 2$$

B)

$$A = \begin{bmatrix} 0.5 & 0.625 \\ 0.2 & 0.75 \end{bmatrix} \quad |A| = 0.5 \times 0.75 - 0.2 \times 0.625 = 0.25$$

$$A^{-1} = \frac{1}{0.25} \begin{bmatrix} 0.75 & -0.625 \\ -0.2 & 0.5 \end{bmatrix} = \begin{bmatrix} 3 & -2.5 \\ -0.8 & 2 \end{bmatrix}$$

C)

$$A = \begin{bmatrix} -3 & 2 \\ 1 & -4 \end{bmatrix} \quad \begin{vmatrix} -3-\lambda & 2 \\ 1 & -4-\lambda \end{vmatrix} = 0$$

$$(-3-\lambda)(-4-\lambda) - 2 = 0 \quad \lambda^2 + 7\lambda + 12 - 2 = 0$$

$$\lambda^2 + 7\lambda + 10 = 0 \quad (\lambda + 2)(\lambda + 5) = 0$$

$$\lambda_1 = -2 \quad \lambda_2 = -5$$

D)

$$\frac{dy}{dx} = \frac{2y}{x} \quad y(1) = 4$$

$$f(1,4) = \frac{2 \times 4}{1} = 8$$

$$y(1.5) = 4 + 8 * 0.5 = 8$$