

NMA Assignment

PAGE No.	
DATE	/ /

1. $r_1 = 12.5 \text{ cm}$

$r_2 = 12.65 \text{ cm}$

i. $A_1 = \pi r_1^2$
 $= \pi (12.5)^2$
 $= 490.874$

$A_2 = \pi r_2^2$
 $= \pi (12.65)^2$
 $= 502.726$

i. Absolute error $= 502.726 - 490.874$
 $= 11.852$

ii. Relative error $= \frac{11.852}{490.874} = 0.024144$

iii. Percentage error $= 2.414\%$

x	y
4.0	0.60206
4.5	0.6532125
5.5	0.7403627
6.0	0.7781513

x	y	Δy
4	0.60206	
6	0.7781513	0.1760913

$h = 2$ $u = \frac{x - x_0}{h} = \frac{5 - 4}{2} = \frac{1}{2}$

$F(x) = 0.60206 + \frac{1}{2} (0.1760913)$
 $= 0.69010565$

b	x	y	Δy
	4.5	0.6532125	0.0871502
	5.5	0.7403627	

$$h = 1 \quad u = \frac{5 - 4.5}{1} = \frac{1}{2}$$

$$F(x) = 0.6532125 + \frac{1}{2}(0.0871502)$$

$$= 0.6967876$$

$$3. \quad x^4 - 2 - 10 = 0$$

$$x_0 = \frac{1.5 + 2}{2} = 1.75$$

$$y_0 = -2.371$$

$$x_1 = \frac{1.75 + 2}{2} = 1.875$$

$$y_1 = -0.2876$$

$$x_2 = \frac{1.875 + 2}{2} = 1.9375$$

$$y_2 = 2.1542131$$

$$x_3 = \frac{1.875 + 1.9375}{2} = 1.90625$$

$$y_3 = 1.298$$

$$x_4 = \frac{1.875 + 1.90625}{2} = 1.890625$$

$$y_4 = 0.886$$

$$4. \quad x^3 - x - 1 = f(x)$$

$$f'(x) = 3x^2 - 1$$

$$x \quad y$$

$$0 \quad -1$$

$$1 \quad -1 \quad -ve$$

$$2 \quad 5 \quad +ve$$

$$x_0 = 1 \quad x = x_0 - \frac{f(x_0)}{f'(x_0)} = 1 - \frac{(-1)}{2} = 1.5$$

$$f(x_0) = -1 \quad f'(x_0) = 2$$

$$f'(x_0) = 2 \quad f(x) = 0.875$$

$$x_1 = 1.5$$

$$x = 1.5 - \frac{0.875}{5.75} = 1.3478$$

$$f(x_1) = 0.875 \quad 5.75$$

$$f'(x_1) = 5.75 \quad f(x) = 0.1$$

$$x_2 = 1.3478$$

$$x = 1.3478 - \frac{0.1}{4.4499} = 1.3252$$

$$f(x_2) = 0.1 \quad 4.4499$$

$$f'(x_2) = 4.4499 \quad f(x) = 0.002058$$

$$x_3 = 1.3252$$

$$x = 1.3252 - \frac{0.002058}{4.268} = 1.3247$$

$$f(x_3) = 0.002058 \quad 4.268$$

$$f'(x_3) = 4.268 \quad y = -6.41 \times 10^{-7}$$

$$A^2 = A$$

$$7A - (I + A)^3$$

$$7A^{-1}A - (A^{-1}I + AA^{-1})^3$$

$$7I - (A^{-1} + I)^3$$

$$A = \begin{bmatrix} 1 & -1 & 2 \\ 4 & 0 & 6 \\ 0 & 1 & -1 \end{bmatrix}$$

Ans

$$A_{11} = -6 \quad A_{12} = -4 \quad A_{13} = 0$$

$$A_{21} = -1 \quad A_{22} = -1 \quad A_{23} = 1$$

$$A_{31} = -6 \quad A_{32} = -2 \quad A_{33} = 4$$

$$|A| = 1(-6) - (-1)(-4) + 2(4) \\ = -6 - 4 + 8 = -2$$

$$A^{-1} = \frac{1}{-2} \begin{bmatrix} -6 & 4 & 0 \\ 1 & -1 & -1 \\ -6 & 2 & 4 \end{bmatrix}^T$$

$$= \frac{1}{-2} \begin{bmatrix} -6 & 1 & -6 \\ 4 & -1 & 2 \\ 0 & -1 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} 3 & -1/2 & 3 \\ 2 & -1/2 & 1 \\ 0 & -1/2 & 2 \end{bmatrix}$$

$$9. a=104 \quad d=3 \quad L=998$$

$$998 = a + (n-1)d$$

$$n = 299$$

$$S_{299} = \frac{299}{2} [2(104) + 298(3)]$$

$$= 164749$$

$$10. t_6 = 32 \quad t_8 = 128$$

$$ar^5 = 32$$

$$ar^7 = 128$$

$$32r^2 = 128$$

$$r^2 = 4$$

$$r = \pm 2$$

$$11. (4+3x)^5$$

$$4^5 + 5(4^4)(3x) + 10(4^3)(3x)^2 + 10(4^2)(3x)^3 + 5(4)(3x)^4 + 3x^5$$

$$= 1024 + 3840x + 5760x^2 + 4320x^3 + 1620x^4 + 3x^5$$

$$12. A = \begin{bmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

$$\lambda^3 - (0)\lambda^2 + (-15+6+(-10+6))\lambda - (2(-15)+3(6))$$

$$\lambda^3 - 13\lambda + 12 = 0$$

$$\lambda = 1 \text{ is a factor}$$

$$1 \quad 1 \quad -13 \quad 12$$

$$\quad \quad 1 \quad -12$$

$$\lambda = 1, 2, 3$$

$$1 \quad -12 \quad 0$$

$$\lambda^2 - 12\lambda = 0$$

$$13 \quad f(x) = x^3 - 7x^2 + 8x - 3$$

$$f'(x) = 3x^2 - 14x + 8$$

$$\begin{array}{c} x \\ 5 \end{array} \quad \begin{array}{c} y \\ -13 \end{array}$$

$$x_0 = 5$$

$$x_1 = 5 + \frac{(-13)}{13} = 4$$

$$f(x_0) = -13$$

$$13$$

$$f'(x_0) = 13$$

$$y_1 = -19$$

$$x_1 = 4$$

$$x_2 = 4 + \frac{(-19)}{0} = 4$$

$$f(x_1) = -19$$

$$0$$

$$f'(x_1) = 0$$

$$y = -19$$

14

$$15. \quad e^{-x} = 3 \log x$$

$$e^{-x} - 3 \log x = 0$$

x	y
1	0.367879
2	-0.7677547

$$x_0 = \frac{1+2}{2} = 1.5$$

$$y_0 = -0.305$$

$$x_1 = \frac{1+1.5}{2} = 1.25$$

$$y_1 = -0.004$$

$$x_2 = \frac{1+1.25}{2} = 1.125$$

$$y_2 = 0.1711$$

$$x_3 = \frac{1.125+1.25}{2} = 1.1875$$

$$y_3 = 0.081$$