

$$n(n-1)y'' + (3n-1)y' + y = 0$$

$$w_1 + w_2 + w_3 = 0$$

w₁

$$v = n(n-1) \quad v' = 2n-1 \quad v'' = 2 \quad v''' = 0$$

$$u = y'' \quad u' = y''' \quad u'' = y^{(4)} \quad u''' = y^{(5)}, \quad u^n = y^{n+2}$$

using Leibniz rule

$$w_1 = y^{n+2} (n(n-1)) + n y^{n+1} (2n-1) + \frac{n(n-1)}{2!} y^n (2) + \frac{n(n-1)(n-2)}{3!} (y^{n-1}) (0)$$

$$w_1 = y^{n+2} (n(n-1)) + n y^{n+1} (2n-1) + n(n-1) y^n$$

w₂ ... (3n-1)

$$v_2 = 3n-1 \quad v' = 3 \quad v'' = 0$$

$$u = y' \quad u' = y'' \quad u'' = y''' \quad \text{hence } u^n = y^{n+1}$$

$$w_2 = y^{n+1} (3n-1) + n y^n (3) + \frac{n(n-2)}{2!} (0) y^{n-1}$$

$$w_2 = y^{n+1} (3n-1) + 3n y^n$$

w₃ ... (y)

$$v = 1 \quad v' = 0$$

$$u = y \quad u' = y' \quad \text{hence } u^n = y^n$$

$$w_3 = y^n (1) + n y^{n-1} (0) + \dots$$

$$w_3 = y^n$$

$$w_2 + w_2 + w_3 = 0$$

$$\therefore y^{n+2} \dots$$

$$y^{n+2}(n(n-1)) + ny^{n+1}(2n-1) + n(n-1)y^n + y^{n+1}(3n-1) + 5ny^n + y^n = 0$$

$$y^{n+2}(n(n-1)) + ny^{n+1}(2n-1) + y^{n+1}(3n-1) + n(n-1)y^n + 5ny^n + y^n = 0$$

$$y^{n+2}(n(n-1)) + ny^{n+1}(2n-1) + y^{n+1}(3n-1) + y^n(n(n-1) + 3n+1) = 0$$

$$y^{n+2}(n(n-1)) + y^{n+1}(n(2n-1) + 3n-1) + y^n(n^2 + 2n+1) = 0$$

$$y^{n+2}(n(n-1)) = -y^n(n(2n-1) + 3n-1) - (n^2 + 2n+1) = 0$$

$$y^{n+2}(n^2 - n) = -y^n(n(2n-1) + 3n-1) - (n^2 + 2n+1)$$

$$y^{n+2}(n^2 - n) = -y^n(n(2n-1) + 3n-1) - (n^2 + 2n+1)$$

$$y^{n+2}(n^2 - n) = -y^{n+1}(n(2n-1) + 3n-1) - y^n(n^2 + 2n+1)$$

$$y^{n+2}(n^2 - n) = -y^{n+1}(n(2n-1) + 3n-1) - y^n(n+1)(n+1)$$

$$y^{n+2}(n^2 - n) = -y^{n+1}(n(2n-1) + 3n-1) - y^n(n+1)^2 \Rightarrow \text{Returning equation}$$

when $n=0$

$$(0)y^n + (3(0) - 1)y' + y = 0$$

$$-y' = y$$

$$y'(0) = y_0$$

when $n=0, n=0$

$$y^2(0) = -y'(-1) - y^0(1)^2$$

$$y' = 1$$

when $n=0, n=1$

$$y^2(0) = -y''(1(-1) - 1) - y'(2)^2$$

$$0 = 2y'' - 4y'$$

$$y'' = 2y' \quad y' = 1 \quad \therefore y'' = 2$$

when $n=0$, $n=0$

$$y'(0) = -y_0'(-0-1) = y_0'$$

$$0 = 3y_0''' - 7y_0''$$

$$7y_0'' = 3y_0'''$$

$$y_0''' = 3y_0'' = 3(2y_0')$$

$$y_0'' = 2!(y_0')$$

when $n=0$, $n=1$

$$y'(0) = -y_0'(-1-1) = 16y_0'$$

$$0 = 4y_0'' = 16y_0'''$$

$$16y_0''' = 4y_0''$$

$$4y_0''' = y_0''$$

$$y_0'' = 4y_0'''$$

$$y_0'' = (4(3(2y_0')))$$

$$y_0'' = 4!(y_0')$$

when $n=0$, $n=4$

$$y'(0) = -y_0'(-4-1) = 25y_0''$$

$$0 = 5y_0'' = 25y_0'''$$

$$25y_0'' = 5y_0'''$$

$$y_0'' = 5y_0'''$$

$$y_0'' = 5(4(3(2y_0')))$$

$$y_0'' = 5!(y_0')$$

when $n=0$, $n=5$

$$y'(0) = -y_0'(-5-1) = 36y_0''$$

$$0 = 6y_0'' = 36y_0'''$$

$$36y_0'' = 6y_0'''$$

$$y_0'' = 6y_0'''$$

$$y_0'' = 6(5(4(3(2y_0'))))$$

$$y_0'' = 7!(y_0')$$

when $n=0$, $n=6$

$$y'(0) = -y_0'(-6-1) = 49y_0''$$

$$0 = 7y_0'' = 49y_0'''$$

$$49y_0'' = 7y_0'''$$

$$y_0'' = 7y_0'''$$

$$y_0'' = 7(6!(y_0'))$$

$$y_0'' = 7y_0'' = 7(6!(y_0'))$$

using the Leibniz method we find

$$y_0 + 2(y_0') + \frac{n^2}{2!}(y_0'') + \frac{n^5}{5!}(y_0''')$$

$$+ \frac{2^4}{4!}y_0'' + \frac{n^5}{5!}y_0'' + \frac{n^4}{6!}y_0''$$

$$+ \frac{n^2}{2!}y_0'' + \dots$$

$$y_0 + ny_0' + \frac{n^2}{2!}(2y_0') + \frac{n^2}{2!}(3!y_0'')$$

$$+ \frac{n^4}{4!}(4!y_0') + \frac{n^5}{5!}(5!y_0'') + \frac{n^4}{6!}(6!y_0''')$$

$$+ \frac{n^2}{2!}(2!y_0')$$

$$y_0 + ny_0' + n^2y_0'' + n^3(y_0''') + n^4y_0''''$$

$$+ n^7(y_0') + n^6(y_0'') + n^7(y_0''') + \dots$$

DLS.
MATHS
Final
PRAT

$$y + y'(n + n^2 + n^3 + n^4 + n^5 + n^6 + n^7)$$

but $y_0 = y_0$

$$y = y_0 (1 + n + n^2 + n^3 + n^4 + n^5 + n^6 + n^7)$$

i.e when $n = 5$ and when $y_0 = y_0 = 0.0005$

$$i) y_5 = 0.0005 (1 + 5 + 5^2 + 5^3 + 5^4 + 5^5 + 5^6 + 5^7)$$

$$y_5 = 0.0005 (97,656)$$

$$y_5 = \underline{48.828}$$

$$ii) y_8 = 0.0005 (1 + 8 + 8^2 + 8^3 + 8^4 + 8^5 + 8^6 + 8^7)$$

$$y_8 = 0.0005 (2,396,745)$$

$$= 1198.3725$$

$$iii) y_{10} = 0.0005 (1 + 10 + 10^2 + 10^3 + 10^4 + 10^5 + 10^6 + 10^7)$$

$$= 0.0005 (11111111)$$

$$= 5555.5555$$

c) 1) Command window

2) clear

3) clc

4) syms n, y

5) n = (0 : 10);

6) $y_0 = 0.0005$

Command window

clear

clc

$$y_0 = 0.0005$$

$$n = (0:10)$$

$$y = y_0 * (1 + x + x^2 + x^3 + x^4 + x^5 + x^6 + x^7)$$

$$Y_n = \text{Sub}(n, y)$$

Plot (n, Yn)

grid on

grid minor

xLabel ('x')

yLabel ('Structural element')

~~SKETCH~~!!!!

GRAPH OF STRUCTURAL ELEMENT AGAINST X.

