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17/ENG08/045

MECHANICAL ENGINEERING

~~Lab~~

$x(x^2-1)y'' + (3x-1)y' + y = 0$

$= (x^2-x)y'' + (3x-1)y' + y = 0$

$A_n = y^{n+2}(x^2-x) + ny^{n+1}(2x) + \frac{n(n-1)}{2!}y^n(2)$

$B_n = y^{n+1}(3x-1) + ny^n(3)$

$C_n = y^n$

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

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

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

at $x = 0$

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

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

$= n-1$

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

$y^{n+1} = y^n(n+1)$

at $n = 0$

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

at $n = 1$

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

at $n = 2$

$y''' = y''(3) = 3(2y^0) = 6y'$

at $n = 3$

$y^{iv} = y'''(4) = 4(6y^0) = 24y'$

at $n = 4$

$y^v = y^{iv}(5) = 5(24y^0) = 120y'$

at $n = 5$

$y^{vi} = y^v(6) = 6(120y^0) = 720y'$

at $n = 6$

$y^{vii} = y^{vi}(7) = 7(720y^0) = 5040y'$

at $n = 7$

$y^{viii} = y^{vii}(8) = 8(5040y^0) = 40320y^0$

$= y_0 + x(y')_0 + \frac{x^2}{2!}(y'')_0 + \frac{x^3}{3!}(y''')_0 + \ldots$

$= y_0 + x(y') + \frac{x^2}{2!}(y')_0 + \frac{x^3}{3!}(6y') + \frac{x^4}{4!}(24y') + \frac{x^5}{5!}(120y') + \frac{x^6}{6!}(720y')$

$+ \frac{x^7}{7!}(5040y')$

$= y_0 + x(y')_0 + x^2(y')_0 + x^3(y')_0 + x^4(y)_0 + x^5(y')_0 + x^6(y')_0 + x^7(y')_0$

$y = y_0 + y'(fx)$

$y = 0.005 \neq y'$

at $= 5, 8 \$ 10$

at 5

$= 0.0005 + 0.0005[5^2 + 5^3 + 5^4 + 5^5 + 5^6 + 5^7]$

$= 0.0005 + 0.0005[113125]$

$= 0.0005 + 56.5625 = 56.563$

at $x = 8$

$y = 0.0005 + 0.0005[8^0 + 8^2 + 8^3 + 8^4 + 8^5 + 8^6 + 8^7]$

$= 0.0005 + 0.0005(2396744)$

$= 1198.373$

at $x = 10$

$y = 0.0005 + 0.0005[10 + 10^2 + 10^3 + 10^4 + 10^5 + 10^6 + 10^7]$

$= 0.0005 + 0.0005(11111110)$

$= 0.005 + 5555.555$

$= 5555.555$

3) Syms x

Syms y

x = (0 : 10);

y = y = 0.0005 + 0.0005 + (x + (x.^2) + (x.^3) + (x.^4) + (x.^5) + (x.^6) + (x.^7)

Plot (x, y)

Grid on