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 101101083
 Civil Engineering

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

Solve
 $\frac{dy}{dx} = \frac{-x(3x-1)y^2 - y}{(3x-1)y}$ $dx = y$

Taking a
 $u = y^{-1}$
 $u' = -y^{-2} y'$

$$u^{(n+2)} = y^{(n+2)}$$

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

$$u^{(n)} = y^{(n)}$$

$$u^{(n-1)} = y^{(n-1)}$$

$$u^{(n-2)} = y^{(n-2)}$$

taking dx

$$u = y^{-1}$$

$$u' = -y^{-2} y'$$

$$u'' = 2y^{-3} y'^2 - y^{-2} y''$$

$$u''' = -6y^{-4} y'^3 + 3y^{-3} y''^2 - y^{-2} y'''$$

$$u^{(4)} = 24y^{-5} y'^4 - 12y^{-4} y'' y' + y^{-3} y'''^2 - y^{-2} y^{(4)}$$

$$u^{(n+2)} = y^{(n+2)}$$

taking as

$$u = y^{-1}$$

$$u' = -y^{-2} y'$$

$$u'' = 2y^{-3} y'^2 - y^{-2} y''$$

$$u''' = -6y^{-4} y'^3 + 3y^{-3} y''^2 - y^{-2} y'''$$

$$u^{(4)} = 24y^{-5} y'^4 - 12y^{-4} y'' y' + y^{-3} y'''^2 - y^{-2} y^{(4)}$$

$$y^{(n+2)} = u^{(n+2)} + n(n-1)u^{(n+1)}u' + n(n-1)(n-2)u^{(n)}u'^2 + \dots$$

$$a_1' = y^{(n+2)} - (3n-3)y^{(n+1)} + n(n-1)y^{(n)} - \dots$$

$$a_2' = y^{(n+1)} - (3n-1)y^{(n)} + ny^{(n-1)}$$

$$a_3' = y^{(n-1)}$$

addition of a1, a2 and a3

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

top = 0

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

$$\int \frac{1}{x^2} dx = -\frac{1}{x} + C$$

$$\int \frac{1}{x^3} dx = -\frac{1}{2x^2} + C$$

$$\int \frac{1}{x^4} dx = -\frac{1}{3x^3} + C$$

$$\int \frac{1}{x^5} dx = -\frac{1}{4x^4} + C$$

$$\int \frac{1}{x^6} dx = -\frac{1}{5x^5} + C$$

$$\int \frac{1}{x^7} dx = -\frac{1}{6x^6} + C$$

$$\int \frac{1}{x^8} dx = -\frac{1}{7x^7} + C$$

$$\int \frac{1}{x^9} dx = -\frac{1}{8x^8} + C$$

$$\int \frac{1}{x^{n+1}} dx = -\frac{1}{nx^n} + C$$

$$\int \frac{1}{x^{n+2}} dx = -\frac{1}{(n+1)x^{n+1}} + C$$

$$\int \frac{1}{x^{n+3}} dx = -\frac{1}{(n+2)x^{n+2}} + C$$

$$\int \frac{1}{x^{n+4}} dx = -\frac{1}{(n+3)x^{n+3}} + C$$

$$\int \frac{1}{x^{n+5}} dx = -\frac{1}{(n+4)x^{n+4}} + C$$

when $n=5$

$$= 6f(y) - 6f(x)f(y)$$

$$= 7af(y)$$

$$f(y) = (11)f(x)$$

$$= 11f(x)$$

$$= 5040f(y)$$

$$y = (y) + \alpha(y) + \frac{\alpha^2}{2} f(y) + \frac{\alpha^3}{6} f(y) + \frac{\alpha^4}{24} f(y) + \frac{\alpha^5}{120} f(y) + \frac{\alpha^6}{720} f(y)$$

$$(y) + \alpha f(y)$$

$$- (y) + \alpha f(y) + \frac{\alpha^2}{2} f(y) + \frac{\alpha^3}{6} f(y) + \frac{\alpha^4}{24} f(y) + \frac{\alpha^5}{120} f(y) + \frac{\alpha^6}{720} f(y)$$

$$+ \frac{6!}{720} \cdot 720 f(y) + \frac{7!}{720} \cdot 5040 f(y)$$

$$= y(1+\alpha) f(y) + (\alpha^2 + \alpha^3 + \alpha^4 + \alpha^5 + \alpha^6) f(y)$$

$$y(1+\alpha) f(y) = 0.0005$$

$$y = (1+\alpha) f(y) + (\alpha^2 + \alpha^3 + \alpha^4 + \alpha^5 + \alpha^6) f(y)$$

when $x=5m, 8m$ and $10m$

$$y = (1+5)(0.0005m) + (5^2 + 5^3 + 5^4 + 5^5 + 5^6) (0.0005)$$

$$y = 2 \times 10^3 m + 48.825m$$

$$y = 48.828m$$

when $x=8m$

$$y = [1+8](0.0005m) + (8^2 + 8^3 + 8^4 + 8^5 + 8^6) (0.0005)$$

$$y = 4.5 \times 10^3 m + 28.76736m (0.0005)$$

$$y = 4.5 \times 10^3 m + 1178m$$

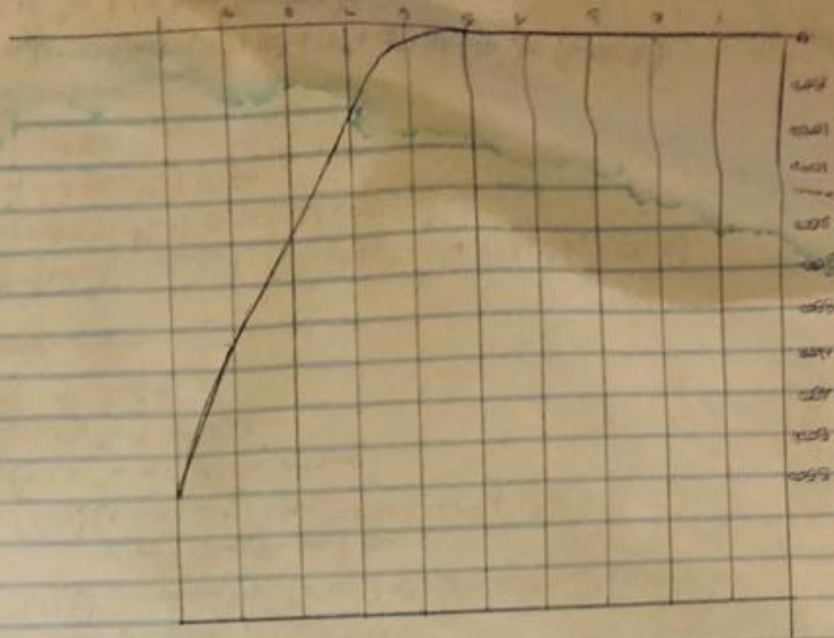
$$y = 1178m$$

when $x=10m$

$$y(1+10)(0.0005)m + (10^2 + 10^3 + 10^4 + 10^5 + 10^6) (0.0005)$$

$$y = 5.5 \times 10^3 m + 11110m (0.0005)m$$

$$y = 5555.5555m$$



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

Command window
 clear
 cla
 close all
 syms x
 f = 0.01 + 0.0005 * (x^2 + x^3 + x^4 + x^5 + x^6 + x^7) * (0.0005);
 plot(x, f);
 hold on
 xlabel('x');
 ylabel('y');
 grid on
 save tight