

NAME

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ID

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6990

Semester

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6<sup>th</sup>

Subject

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Maths(2)

Department

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Electrical

Summer #

Submitted to #

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Pg # 1

(Q001) Estimate the general solution

of  $y' = (x+2)y^2$

sol

$$\frac{dy}{dx} = (x+2)y^2$$

$$\frac{dy}{y^2} = (x+2) dx$$

$$y^{-2} dy = (x+2) dx$$

$$\int y^{-2} dy = \int (x+2) dx$$

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

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

$$-y^{-1} = \frac{x^2+4x+2C}{2}$$

$$\frac{-(x^2+4x+2C)}{2} = y$$

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(Pg 2)

$$\Rightarrow y = \frac{-2}{x^2 + 4x + 4}$$

$$\# y = -2(x^2 + 4x + 4)^{-1}$$

Hence  $-2(x^2 + 4x + 4)^{-1}$  is

General solution of y

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(Q No 2) Find the general solution

$$\text{OF } x^3 dx + y^3 dy = 0$$

Sol

Ist method.

$$u = \int M dx + \int N y dy \rightarrow *$$

$$\Rightarrow \int M dx = \int x^3 dx = \frac{x^4}{4} + c$$

$$\# \int N y dy = \int y^3 dy = \frac{y^4}{4} + c$$

(Put in 1)

$$u = \frac{x^4}{4} + c + \frac{y^4}{4} + c$$

$$u = \frac{x^4}{4} + \frac{y^4}{4} + 2c = 0$$

$$u = \frac{x^4}{4} + \frac{y^4}{4} + 2c =$$

$$\frac{x^4}{4} + \frac{y^4}{4} = c \text{ Key.}$$

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2nd Methods differential

homogenous method:

$$x^3 dx = -y^3 dy$$

$$\frac{-x^3}{y^3} = \frac{dy}{dx}$$

$$\div \text{ by } x^3$$

$$\frac{-1}{y^3} = \frac{dy}{dx} = \textcircled{1}$$

new independent variable  $v^4$   
by using substitution

$$\# \frac{y}{x} = v$$

$$\# y = xv$$

$$\# \frac{dy}{dx} = v + x \frac{dv}{dx}$$

put in eq, (1)

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$$\frac{-1}{v^3} = v^4 \times \frac{dv}{dx}$$

$$\frac{-1}{v^3} - v = x \frac{dv}{dx}$$

$$\frac{(1-v^4)}{v^3} = x \frac{dv}{dx}$$

$$\frac{dx}{x} = \frac{dv}{\frac{(1-v^4)}{v^3}}$$

$$\frac{dx}{x} = \frac{v^3}{1-v^4} dv$$

$$\frac{dx}{x} = \frac{v^3}{v^4-1} dv$$

Integrating

$$\int \frac{dx}{x} = \int \frac{v^3}{v^4-1} dv$$

$$\int \frac{dx}{x} = \frac{1}{3} \int \frac{3v^3 dv}{v^4-1}$$

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$$\log x^{\frac{1}{3}} = \frac{1}{3} \log (x^4 - 1)$$

$$3 \log x = \log (x^4 - 1)$$

$$\log (x^3)^3 = \log (x^4 - 1)$$

$$x^3 = x^4 - 1$$

$$x^3 = \frac{y^4 - 1}{x^4}$$

$$x^3 = \frac{y^4 - x^4}{x^4} \quad \therefore c^3 = c$$

$$c = \frac{y^4 - x^4}{x^4} \quad \text{Ans}$$