$$x \cdot y' + y = 2x \quad / : x$$

$$y' + \frac{y}{x} = 2$$

GIE=SIE+GHE

GIE - general inhomogeneous equation
SIE - specific inhomogeneous equation
GHE - general homogeneous equation

Homogeneous equation:

$$\frac{dy}{dx} + \frac{y}{x} = 0$$

$$\frac{dy}{dx} = \frac{-y}{x} = 0$$

$$-\int \frac{dy}{y} = \int \frac{dx}{x} \qquad y = 0$$

$$-\ln|y| + C_a = \ln|x| + C_b$$

$$C_a + C_a = C_*$$

$$\ln C_0 = C_*$$

tak wetrebaa

$$|y| = -e^{-(\ln|x| + C_*)}$$

$$|y| = e^{-\ln|x|} \cdot e^{c} = C$$

$$|y| = C \cdot e^{-\ln|x|}$$

$$\begin{cases} y = \pm C \cdot e^{-\ln|x|} \\ y = 0 \end{cases}$$

$$y' = \frac{\pm C \cdot e^{-\ln|x|}}{x}$$

$$\ln|y| = -\ln|x| + C_*$$

$$\ln|y| = \ln C_0^* - \ln|x|$$

$$\ln|y| = \ln \frac{C_0}{|x|}$$

$$|y| = \frac{C_0}{|x|}$$

$$y = \frac{C_0}{\pm x} \to C$$

$$y = \frac{C}{x}$$

General homogeneous equation:

$$\begin{cases} y = \frac{C}{x} \\ y = 0 \end{cases}$$

Variation of constant C -> C(x):

$$y = \frac{C(x)}{x} = C(x) \cdot x^{-1} \Rightarrow y' = \frac{C'(x)}{x} - \frac{C(x)}{x^2} = \frac{C'(x) \cdot x - C(x)}{x^2}$$

$$y' = \frac{C'(x)}{x} - \frac{C(x)}{x^2} = \frac{C'(x) \cdot x - C(x)}{x^2}$$

http://www.mbstudent.com/maths-examples.html

$$\frac{C'(x)\cdot x - C(x)}{x^2} + \frac{1}{x}\cdot\frac{C(x)}{x} = 2$$

$$\frac{C'(x)\cdot x}{x^2} - \cancel{\frac{C(x)}{x^2}} + \cancel{\frac{C(x)}{x^2}} = 2$$

$$\frac{C'(x)}{x} = 2 \rightarrow C'(x) = 2x$$

$$C(x) = \int 2x\cdot dx = 2\cdot\int x\cdot dx = \cancel{2}\cdot\frac{x^2}{\cancel{2}} + C_M$$

GIE after inserting C(x):

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

$$\underbrace{y = x + \frac{C_M}{x}}$$

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