

$$\frac{dy}{dt} + x = 0 \quad y(0) = 0 \quad \frac{dx}{dt} + y = 0 \quad x(0) = 1$$

Solve for the solutions of x and y .

$$y' + x = 0 \quad \text{--- (1)}$$

$$y'' + x' = 0$$

$$y'' - y = 0$$

$$\Rightarrow y'' - 0y' - y = 0 \quad \text{--- (1)}$$

from the form

$$y'' + ay' + b = 0 \quad \text{--- (2)}$$

$$\Rightarrow a = 0 \quad b = -1$$

$$a^2 = 0 \quad 4b = -4$$

$$a^2 > 4b$$

\Rightarrow Soln is of the form

$$y = C_1 e^{r_1 t} + C_2 e^{r_2 t} \quad \text{--- (3)}$$

Now from (1)

$$r^2 - 1 = 0$$

$$r^2 = 1 \quad r = \pm 1$$

and (3) becomes

$$y = C_1 e^t + C_2 e^{-t}$$

initial conditions $y(0) = 0$

$$\Rightarrow 0 = C_1 + C_2$$

then

$$x' + y = 0$$

$$x' = -y$$

$$x'' = -y'$$

$$x' + y = 0$$

$$x'' + y' = 0$$

$$\text{then from (1)} \quad x'' - x = 0$$

$$\Rightarrow x'' - 0x' - x = 0 \quad \text{--- (5)}$$

from form $x'' + ax + b = 0$

$$a = 0 \quad b = -1$$

$$a^2 = 0 \quad 4b = -4$$

$$a^2 > 4b$$

\Rightarrow soln is of the form

$$x = C_1 e^{r_1 t} + C_2 e^{r_2 t}$$

$$r^2 - 1 = 0$$

$$\text{from (5)} \quad r^2 - 1 = 0$$

$$r^2 = 1$$

$$r = \pm 1$$

$$x = C_1 e^t + C_2 e^{-t}$$

initial conditions $x(0) = 1$

$$\Rightarrow 1 = C_1 + C_2 \quad ??$$

how can this be if from previous $0 = C_1 + C_2$??