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

① when $0 \le x < 1$ then $\frac{dy}{dx} + y = 2$

$$I\cdot F = e^{\int 1 dx} = e^{x}$$

$$y\cdot e^{x} = \int 2\cdot e^{x} dx + C \Rightarrow ye^{x} = 2e^{x} + C$$

$\because$ $y(0) = 0$ so $0\cdot e^{0} = 2\cdot e^{0} + C \Rightarrow 0 = 2 + C$

$$\underline{C = -2}$$

<u>hence</u>

$$y\cdot e^{x} = 2e^{x} - 2$$

$$y(x) = 2 - 2e^{-x}$$

$$\underline{y(x) = 2(1 - e^{-x})} \quad ; \text{ when } \underline{0 \le x < 1}$$

<u>when</u> $\underline{x \geq 1}$ then $f(x) = 0$

<u>so</u> $\frac{dy}{dx} + y = 0 \Rightarrow \frac{dy}{dx} = -y$

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

$$\ln y = -x + \ln C \Rightarrow \ln(y) - \ln C = -x$$

$$\frac{y(x)}{C} = e^{-x} \Rightarrow y(x) = Ce^{-x}$$

$\because \; y(0) = 0$

$0 = c \cdot e^{0} \Rightarrow c = 0$

So $\underline{y(x) = 0}$