$$x^{(3)} = 1 + \int_0^t 3x^{(2)}(s)\, s^2 ds = 1 + 3\int_0^t \left(1 + s^3 + \frac{s^6}{2}\right) s^2 ds =$$

$$= 1 + t^3 + \frac{t^6}{2} + \frac{t^{12}}{2\cdot 3}$$

$$\vdots$$

$$x^{(n)} = 1 + t^3 + \frac{(t^3)^2}{2!} + \dots + \frac{(t^3)^n}{n!}$$

$$= \sum_{k=0}^{n} \frac{(t^3)^k}{k!} \xrightarrow{n\to\infty} \underline{\underline{e^{t^3}}}$$

.. solution to (1).

2.) $y'' + y' - 2y = 0$

characteristic equ.: $\lambda^2 + \lambda - 2 = 0$

$$\lambda_{1,2} = -\frac{1}{2} \pm \sqrt{\frac{1}{4} + 2} =$$

$$= -\frac{1}{2} \pm \frac{\sqrt{5}}{2}$$

$\Rightarrow$ general sln.

$$y(t) = C_1 e^{\left(-\frac{1}{2} + \frac{\sqrt{5}}{2}\right)t} + C_2 e^{\left(-\frac{1}{2} - \frac{\sqrt{5}}{2}\right)t}$$

$C_1, C_2 \in \mathbb{R}$.

5:00 PM

1. (i) see 9:00 AM quiz.

(ii) $f(t,x) = xt$ is continuous on $\mathbb{R}^2$

$\frac{\partial f}{\partial x} = t$ is continuous on $\mathbb{R}^2$

$\Rightarrow$ (1) has a unique sln. according to the thm. of Picard Lindelöf