

1st quiz (Thu 10/09)

9:00 AM - solutions

14/14

$$1. \begin{cases} t \cdot y' - 2y = 2t^4 \\ y(1) = 2 \end{cases}$$

(i) order = 1 (1)

linear inhomogeneous eq.

(ii) homog. (gen. solution):

$$t y_h' - 2y_h = 0$$

$$\frac{y_h'}{y_h} = \frac{2}{t} \Rightarrow \ln |y_h| = 2 \ln |t| + D = \ln |t|^2 + D$$

(3) ~~homog.~~ $y_h(t) = C t^2, C \in \mathbb{R}.$

inhomog. (varial. of const.)

$$y = C(t) t^2$$

$$\Rightarrow t(C'(t)t^2 + C(t)2t) - 2C(t)t^2 = 2t^4$$

$$C'(t)t^3 = 2t^4$$

$$C'(t) = 2t$$

using $y(1) = 2 \Rightarrow 2 = y(1) = C(1) \quad (1)$

$$\Rightarrow C(t) - \underbrace{C(1)}_{=2} = t^2 - 1$$

$$C(t) = t^2 + 1$$

$$\Rightarrow \underline{\underline{y(t) = (t^2 + 1)t^2 = t^4 + t^2}}$$

(27)