

$$x y'' - y' = 3 x^2$$

$$x^2 y'' - x y' = 3 x^3$$

Cauchy Euler Equation

$$z = \log x \quad \text{or } x = e^z$$

$$x \frac{d}{dx} = \frac{d}{dz}, \quad x^2 \frac{d^2}{dx^2} = \frac{d^2}{dz^2} - \frac{d}{dz}$$

$$D(D-1)y - Dy = 3 e^{3z}$$

$$(D^2 - 2D)y = 3 e^{3z}$$

$$P.I. = \frac{1}{D^2 - 2D} 3 e^{3z}$$

$$= 3 \cdot \frac{1}{3^2 - 6} e^{3z}$$

$$= e^{3z}$$

$$= x^3$$

$$\therefore y_p = \alpha x^3$$

$$\alpha = 1$$

