

$$\frac{dy}{dx} = \frac{4\sqrt{y} \ln x}{x}, \quad y(e) = 1$$

$$\int \frac{1}{\sqrt{y}} \frac{dy}{dx} dx = \int \frac{4 \ln x}{x} dx \quad \frac{d}{dx}(y)$$

$$\int \frac{1}{\sqrt{y}} dy = 4 \int \frac{\ln x}{x} dx \quad \text{Let } u = \ln x$$

$$2y^{\frac{1}{2}} = 4 \int u du \quad du = \frac{1}{x} dx$$

$$y^{\frac{1}{2}} = 2 \frac{u^2}{2} + C$$

$$y^{\frac{1}{2}} = (\ln x)^2 + C \quad \text{By the initial condition}$$

OPTION 1

$$y^{\frac{1}{2}} = (\ln x)^2$$

$$y = (\ln x)^4$$

$$y(e) = 1$$

$$C = 0$$

$$y^{\frac{1}{2}} = (\ln x)^2 + C$$

$$y = (\ln x)^4 + 2C(\ln x)^2 + C^2$$

$$y(e) = 1 \quad y = [\ln x^2 + C]^2$$

$$1 = 1 + 2C + C^2 \quad (1+C)^2 = 1$$

$$1 = (C+1)^2 \quad C = 0$$

$$C = 0 \text{ or } -2$$