

Given that $y = x^2 \ln x$, find $\frac{dy}{dx}$

$$y = x^2 \ln x$$

Use the Product Rule

$$y = uv$$
$$\frac{dy}{dx} = u \frac{dv}{dx} + \frac{du}{dx} v$$

$$u = x^2 \quad v = \ln x$$

$$\frac{du}{dx} = 2x \quad \frac{dv}{dx} = \frac{1}{x}$$

$$\frac{dy}{dx} = u \frac{dv}{dx} + \frac{du}{dx} v$$

$$\frac{dy}{dx} = x^2 \frac{1}{x} + 2x \ln x$$

$$\frac{dy}{dx} = x + 2x \ln x$$

$$\frac{dy}{dx} = x(1 + 2 \ln x)$$