

$$1. \text{ Q — } \int (\ln(x))^2 dx$$

$$\text{A — Let } u = (\ln(x))^2 \text{ and } v' = 1.$$

$$\begin{aligned} \frac{d}{dx}(\ln(x))^2 &= 2\ln(x) \frac{d}{dx} \ln(x) \\ &= \frac{2\ln(x)}{x} \end{aligned}$$

$$\text{Therefore } u' = \frac{2\ln(x)}{x} \text{ and } v = x$$

According to integration by parts:

$$\int uv' = uv - \int vu'$$

$$\text{Therefore } \int (\ln(x))^2 dx = x(\ln(x))^2 - 2 \int \ln(x) dx$$

$$\text{To calculate } \int \ln(x) dx, \text{ let } u = \ln(x) \text{ and } v' = 1.$$

$$\text{Therefore } u' = \frac{1}{x} \text{ and } v = x$$

$$\text{Therefore } \int \ln(x) dx = x \ln(x) - \int 1 dx$$

$$= x \ln(x) - x + C_1$$

$$\text{Therefore } \int (\ln(x))^2 dx = x(\ln(x))^2 - 2[x \ln(x) - x] + C$$

$$= x(\ln(x))^2 - 2x \ln(x) + 2x + C$$