Quiz 5

1) Integrate the following:

i) \( \int x \ln(x) \, dx \) \hspace{1cm} 3pts

ii) \( \int \frac{1}{x \ln(x)} \, dx \) \hspace{1cm} 3pts

iii) \( \int \frac{\ln(x)}{x^2} \, dx \) \hspace{1cm} 3pts

2) Fold your paper lengthwise and print (not sign) your name and section # 1pt
i) \( \int x \ln(x) \, dx \)

Let \( u = \ln(x) \) \quad du = \frac{1}{x} \, dx \\
\quad du = \frac{1}{x} \quad v = \frac{x^2}{2} \\
\therefore \ln(x) \cdot \frac{x^2}{2} - \int \frac{x^2}{2} \cdot \frac{1}{x} \, dx \quad \text{(1)}

\begin{align*}
\ln(x) \cdot \frac{x^2}{2} - \int \frac{x}{2} \, dx &= \ln(x) \cdot \frac{x^2}{2} - \frac{x^2}{4} + C \quad \text{(1)}
\end{align*}

ii) \( \int \frac{1}{x \ln x} \, dx \)

Let \( u = \ln(x) \) \quad du = \frac{1}{x} \, dx \\
\therefore \ln(x) \ln|\ln(x)| + C = \ln|\ln(x)| + C \quad \text{(1)}

iii) \( \int \frac{\ln x}{x^2} \, dx \)

Let \( u = \ln x \) \quad du = \frac{1}{x^2} \, dx \\
\quad du = \frac{1}{x} \, dx \quad v = -\frac{1}{x} \\
\therefore -\frac{1}{x} \ln x - \int -\frac{1}{x} \cdot \frac{1}{x} \, dx = -\frac{1}{x} \ln x + \int \frac{1}{x^2} \, dx \\
\quad \text{(1)}

\begin{align*}
-\frac{1}{x} \ln x - \frac{1}{x} + C \quad \text{(1)}
\end{align*}