

Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 4 (B)

Question 1. Evaluate the following integrals:

(a) (5 marks)

$$\int x^6 \ln x \, dx$$

$$= uv - \int v \, du$$

$$= \frac{x^7 \ln x}{7} - \int \frac{x^7}{7} \cdot \frac{1}{x} \, dx = \frac{x^7 \ln x}{7} - \frac{1}{7} \int x^6 \, dx$$

$$= \frac{x^7 \ln x}{7} - \frac{1}{7} \cdot \frac{x^7}{7} + C = \frac{x^7 \ln x}{7} - \frac{1}{49} x^7 + C$$

$$\left. \begin{aligned} \text{LET } u &= \ln x & dv &= x^6 \, dx \\ du &= \frac{1}{x} \, dx & v &= \frac{x^7}{7} \end{aligned} \right\}$$

(b) (5 marks)

$$\int_e^{e^4} \frac{dt}{t\sqrt{\ln t}}$$

$$= \int_1^4 \frac{t \, du}{t \sqrt{u}} = \int_1^4 u^{-1/2} \, du$$

$$= 2u^{1/2} \Big|_1^4$$

$$= 2(4)^{1/2} - 2(1)^{1/2}$$

$$= 4 - 2 = 2$$

$$\left. \begin{aligned} \text{LET } u &= \ln t \\ du &= \frac{1}{t} \, dt \\ dt &= t \, du \end{aligned} \right\}$$

$$du = \frac{1}{t} dt$$

$$dt = t \, du$$

$$\text{IF } t = e \Rightarrow u = 1$$

$$t = e^4 \Rightarrow u = \ln e^4 = 4$$