

MATH 212 Quiz 2 NAME:

Evaluate the following integrals.

a. $\int x e^{4x} dx$

b. $\int \ln x dx$

c. $\int \sin^4 x \cos^3 x dx$

Solutions:

(a) Let $u = x$ and $dv = e^{4x} dx$ so that $du = dx$ and $v = \frac{1}{4}e^{4x}$. By integration by parts,

$$\begin{aligned}\int x e^{4x} dx &= \frac{1}{4} x e^{4x} - \int \frac{1}{4} e^{4x} dx \\ &= \frac{1}{4} x e^{4x} - \frac{1}{16} e^{4x} + C.\end{aligned}$$

(b) Let $u = \ln x$ and $dv = dx$ so that $du = \frac{1}{x} dx$ and $v = x$. By integration by parts,

$$\begin{aligned}\int \ln x dx &= x \ln x - \int x \frac{1}{x} dx \\ &= x \ln x - x + C.\end{aligned}$$

(c)

$$\begin{aligned}\int \sin^4 x \cos^3 x dx &= \int \sin^4 x \cos^2 x \cos x dx \\ &= \int \sin^4 x (1 - \sin^2 x) \cos x dx \\ &= \int u^4 (1 - u^2) du \quad u = \sin x \\ &= \frac{u^5}{5} - \frac{u^7}{7} + C \\ &= \frac{\sin^5 x}{5} - \frac{\sin^7 x}{7} + C.\end{aligned}$$