NAME: ISAAC ENG GRACE
DEPARTMENT: BIOMEDICAL ENGINEERING
MATRIC NUMBER: 19/~~ENG~~08/004

MAT 104 ASSIGNMENT

Integrate the following:

1. $x^{1/2} \ln x$

Solution

$$\int x^{1/2} \ln x \, dx = \int u\,dv = uv - \int v\,du$$

$u = \ln(x)$, $du = \frac{1}{x}dx$

$dv = x^{1/2}$, $v = \int x^{1/2}dx = \frac{x^{1/2+1}}{1/2+1} = \frac{x^{3/2}}{3/2}$

$= \frac{2x^{3/2}}{3}$

Recall;

$$\int u\,dv = \ln(x)\cdot\frac{2}{3}x^{3/2} - \int \frac{2}{3}x^{3/2}\cdot\frac{1}{x}dx = \frac{2}{3}x^{3/2}\ln(x) - \frac{2}{3}\frac{x^{1/2+1}}{\frac{1}{2}+1}$$

$$= \frac{2}{3}x^{3/2}\ln(x) - \frac{2}{3}\cdot\frac{x^{3/2}}{3/2} = \frac{2}{3}x^{3/2}(\ln x) - \frac{4}{9}x^{3/2}$$

$$= \frac{2}{3}\sqrt{x^3}\cdot\left(\ln(x) - \tfrac{2}{3}\right) + c$$

2. $2\cos 6t \cos t \, dt$

solution.

$$\int 2\cos(6t)\cos(t) = 2\int \cos(6t)\cos(t)$$

Recall;

$$\cos Ax \cos Bx = \frac{1}{2}[\cos(A-B)x + \cos(A+B)x]$$

$$= 2\int \frac{1}{2}[\cos(6-1)t + \cos(6+1)t]$$

$$= 2\times\frac{1}{2}\int \cos(5t) + \cos(7t)]$$

$$= \int \cos(5t) + \cos(7t)$$

$$= \int \cos(5t)\,dt + \int \cos(7t)\,dt$$

$$= \frac{\sin(5t)}{5} + \frac{\sin(7t)}{7} + c$$

3. sin

∫

3. $\sin^3 x \cos^4 x$

Solution

$$\int \sin^3(x)\cos^4(x)\,dx = \int \sin(x)\cdot\sin^2(x)\cdot\cos^4(x)$$

$$= \int \sin(x)[1-\cos^2(x)]\cdot\cos^4(x)$$

Let $u = \cos(x)$

$$\frac{du}{dx} = -\sin(x) \Rightarrow -du = \sin(x)\,dx$$

$$= \int \sin(x)[1-u^2]u^4\,dx = \int (1-u^2)u^4 \sin(x)\,dx$$

$$= \int (1-u^2)u^4 \cdot -du$$

$$= \int (u^6 - u^4)\,du = \frac{u^7}{7} - \frac{u^5}{5} + C$$

$$= \frac{\cos^7(x)}{7} - \frac{\cos^5(x)}{5} + C$$