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

$$\int \cos(x) \sin^3(x)\, dx$$

$$u = \sin(x) \longrightarrow \frac{du}{dx} = \cos(x)$$

$$\int u^3 du$$

$$\int u^n du = \frac{u^{n+1}}{n+1} \quad \text{with } n = 3$$

$$= \frac{u^4}{4}$$

$$= \frac{\sin^4(x)}{4} + C$$

$$\therefore \int \sin^6(x)\,dx = \frac{-\sin(6x) - 9\sin(4x) + 45\sin(2x) - 60x}{192} + C$$

2) $\cos^4 x \sin^3 x$

$\sin^2(x) = 1 - \cos^2(x)$

$= \int -\cos^4(x)(\cos^2(x) - 1) \cdot \sin(x)\,dx$

$u = \cos(x) \rightarrow \frac{du}{dx} = -\sin(x)$

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

$= \int (u^6 - u^4)\,du$

$= \int u^6\,du - \int u^4\,du$

Solving $\int u^6\,du$

$\int u^n\,du = \frac{u^{n+1}}{n+1}$ with $n = 6$;

$= \frac{u^7}{7}$

Solving $-\int u^4\,du$

$n = 4$;

$= \frac{u^5}{5}$

Substituting $\int u^6\,du - \int u^4\,du$

$= \frac{u^7}{7} - \frac{u^5}{5}$

$u = \cos(x)$

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

NAME: AKINMOLA VICTOR BOLUWATIFE

MATRIC NO: FI/MHS01/073

COURSE CODE: MAT 104

Assignment Solution

2)

A) $\sin^6 x$

$$\int \sin^6(x)\,dx$$

$$\int \sin^n(x)\,dx = \frac{n-1}{n}\int \sin^{n-2}(x)\,dx - \frac{\cos(x)\sin^{n-1}(x)}{n}$$

When $n=6$: $= -\frac{\cos(x)\sin^5(x)}{6} + \frac{5}{6}\int \sin^4(x)\,dx$

Solving $\int \sin^4(x)\,dx$

$n=4$;

$$= -\frac{\cos(x)\sin^3(x)}{4} + \frac{3}{4}\int \sin^2(x)\,dx$$

Solving $\int \sin^2(x)\,dx$

$n=2$;

$$= -\frac{\cos(x)\sin(x)}{2} + \frac{1}{2}\int 1\,dx$$

Solving $\int 1\,dx$:

$= x$:

$$-\frac{\cos(x)\sin(x)}{2} + \frac{1}{2}\int 1\,dx = \frac{x}{2} - \frac{\cos(x)\sin(x)}{2}$$

$$-\frac{\cos(x)\sin^3(x)}{4} + \frac{3}{4}\int \sin^2(x)\,dx = -\frac{\cos(x)\sin^3(x)}{4} - \frac{3\cos(x)\sin(x)}{8} + \frac{3x}{8}$$

$$-\frac{\cos(x)\sin^5(x)}{6} + \frac{5}{6}\int \sin^4(x)\,dx$$

$$\Rightarrow -\frac{\cos(x)\sin^5(x)}{6} - \frac{5\cos(x)\sin^3(x)}{24} - \frac{5\cos(x)\sin(x)}{16} + \frac{5x}{16}$$

$\therefore \int \sin^6(x)\,dx$

$\Rightarrow$