Name: Adenigan Damola
Matric No: 19/mhs01/034
Medicine $ Surgery

1.) $\int \sin^6 x = \int (\sin^2 x)^3$

$$\int \sin^6 x = \int (\sin^2 x)^2 \sin^2 x$$

$$= \int \left(\frac{1-2\cos 2x + \cos^2 2x}{4}\right)\left(\frac{1-\cos 2x}{2}\right)$$

$$\int \sin^6 x = \frac{1}{8}\int (1-2\cos 2x + \cos^2 2x)(1-\cos 2x)$$

$$\int \sin^6 x = \frac{1}{8}\int (1-2\cos 2x + \cos^2 2x - \cos 2x + 2\cos^2 2x - \cos^3 2x$$

$$\int \sin^6 x = \frac{1}{8}\int (1-3\cos 2x + 3\cos^2 2x - \cos^3 2x)$$

$$\int \sin^6 x = \frac{1}{8}\int (1-3\cos 2x + 3\left(\frac{1-\cos 4x}{2}\right) - (\cos^2 2x)(\cos 2x)$$

$$\int \sin^6 x = \frac{1}{8}\left(\int 1-3\cos 2x + \frac{3}{2} + \frac{3\cos 4x}{2} - (1-\sin^2 2x)\cos 2x\right)$$

$$\int \sin^6 x = \frac{1}{8}\left(\int \frac{5}{2} - 3\cos 2x + \frac{3\cos 4x}{2} - \int (1-\sin^2 2x)\cos 2x\right.$$

let $u = \sin 2x$

$\frac{du}{dx} = 2\cos 2x$

$dx = \frac{du}{2\cos 2x}$

$$= \frac{1}{8}\left(\frac{5x}{2} - \frac{3}{2}\sin 2x + \frac{3}{8}\sin 4x - (1-u^2)\cos 2x \frac{du}{2\cos 2x}\right.$$

$$= \frac{1}{8}\left(\frac{5x}{2} - \frac{3\sin 2x}{2} + \frac{3\sin 4x}{8} - \int \frac{1}{2} - \frac{u^2}{2}\, du\right.$$

$$= \frac{1}{8}\left(\frac{5x}{2} - \frac{3\sin 2x}{2} + \frac{3\sin 4x}{8} - \left(\frac{u}{2} - \frac{u^3}{6}\right)\right) + C$$

$$= \frac{1}{8}\left(\frac{5x}{2} - \frac{3\sin 2x}{2} + \frac{3\sin 4x}{8} - \frac{\sin 2x}{2} + \frac{\sin^3 2x}{6} + C\right.$$

$$\int \sin^6 x = \frac{1}{16}\left(5x - 3\sin 2x + \frac{3\sin 4x}{4} - \sin 2x + \frac{\sin^3 2x}{3}\right] + C$$

$$\int \sin^6 x = \frac{1}{16}\left(5x - 4\sin 2x + \frac{3\sin 4x}{4} + \frac{\sin^3 2x}{3} + C\right.$$

2.) $\cos^4 x \sin^3 x$ = let $u = \cos x$ $\quad \frac{du}{dx} = -\sin x$ $\quad dx = \frac{du}{-\sin x}$

$$\int \cos^4 x \sin^3 x = \int u^4 \sin^3 x \cdot \frac{du}{-\sin x}$$

$$\int \cos^4 x \sin^3 x = -\int u^4 \sin^2 x \cdot du$$

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

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

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

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

$$= \left[\frac{u^7}{7} - \frac{u^5}{5}\right] + C$$

$$\int \cos^4 x \sin^3 x = \frac{\cos^7 x}{7} - \frac{\cos^5 x}{5} + C$$

3.) $\int \cos x \sin^3 x$ = let $u = \cos x$ $\quad \frac{du}{dx} = -\sin x$ $\quad dx = \frac{du}{-\sin x}$

$$\int \cos x \sin^3 x = \int u \sin^3 x \, \frac{du}{-\sin x}$$

$$\int \cos x \sin^3 x = -\int u \sin^2 x \cdot du$$

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

$$\int \cos x \sin^3 x = -\int u (1-u^2)\, du$$

$$\int \cos x \sin^3 x = -\int u - u^3\, du$$

$$= -\left[\frac{u^2}{2} - \frac{u^4}{4}\right]$$

$$\int \cos x \sin^3 x = \left[\frac{u^4}{4} - \frac{u^2}{2}\right] + C$$

$$\int \cos x \sin^3 x = \frac{\cos^4 x}{4} - \frac{\cos^2 x}{2} + C$$