Name: Patunola Olawumoke Folake
DEPT: MBBS
MATRIC NO: 19/mb001/382
COURSE CODE: Maths 104

(A-B)

Solution

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

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

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

$= \frac{1}{8}\left(1 - 2\cos 2x + \cos^2 2x\right)(1-\cos 2x)$

$= \frac{1}{8}\left(1 - 2\cos 2x + \frac{1+\cos 4x}{2}\right)\left(1-\cos 2x\right)$

multiply thr by 2

$= \frac{1}{16}(2 - 4\cos 2x + 1 + \cos 4x)(1-\cos 2x)$

$= \frac{1}{16}(3 - 4\cos 2x + \cos 4x)(1-\cos 2x)$

$= \frac{1}{16}(3 - 4\cos 2x + \cos 4x - 3\cos 2x + 4\cos^2 2x - \cos 4x \times \cos 2x)$

$= \frac{1}{16}(3 - 7\cos 2x + \cos 4x - (2(2\cos^2 2x) - \frac{1}{2} 2\cos 4x \times \cos 2x$

$= \frac{1}{16}(3 - 7\cos 2x + \cos 4x + 2(1+\cos 4x) - \frac{1}{2}(\cos 6x + \cos 2x)$

$= \frac{1}{16}(3 - 7\cos 2x + \cos 4x + 2 + 2\cos 4x - \frac{1}{2}(\cos 6x + \cos 2x$

multipy thr all by 2

$\frac{1}{32}(6 - 14\cos 2x + 2\cos 4x + 4 + 4 + 4\cos 4x - \cos 6x - \cos 2x$

$\frac{1}{32}(10 - 15\cos 2x + 6\cos 4x - \cos 6x)$

let $\sin^6 x = R$

$R = \frac{1}{32}\int (10 - 15\cos 2x + 6\cos 4x - \cos 6x)\,dx$

$R = \frac{1}{32}\left(10x - \frac{15\sin 2x}{2} + \frac{6\sin 4x}{4} - \frac{\sin 6x}{6} + C\right.$

$\int \sin^6 x = \frac{10x}{32} - \frac{15\sin 2x}{64} + \frac{6\sin 4x}{128} - \frac{\sin 6x}{192} + C$

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

It can be rewrite as

$\int \sin^3 x \cos^4 x \, dx$

$\sin^3 x \cos^4 x = (1-\cos^2 x)\cos^4 x \sin x$

$= \cos^4 x \sin x - \cos^6 x \sin x$

$\int (\cos^4 x \sin x - \cos^6 x \sin x) \, dx$

$= \frac{-1}{5}\cos^5 x + \frac{1}{7}\cos^7 x + C$

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

It can be rewrite as

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

let $u = \sin x$

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

$du = \cos x \, dx$

With this substitution

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

using reverse power rule

$\int u^3 du = \frac{u^{3+1}}{3+1} + C = \frac{u^4}{4} + C$

hence $u = \sin x$

$\int \sin^3 x \cos x \, dx = \frac{\sin^4 x}{4} + C$