

NAME: KOBLOLU ANOBAMF FOLU50
Matric number: 1911745011230
College: MHS

Department: MBS

1. $\int \sin^6 x$

$$\int (\sin^3 x)^2$$

Recall: $\sin^3 x = \frac{1}{4} [3\sin x - \sin 3x]$

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

$$\int \sin^6 x = \frac{1}{16} [9\sin^2 x + \sin^2 3x - 6\sin 3x \sin x]$$

$$= \frac{1}{16} \left[9 \frac{(1 - \cos 2x)}{2} + \frac{(1 - \cos 6x)}{2} - 3(\cos 2x - \cos 4x) \right]$$

$$= \frac{1}{16} \left[\frac{9x}{2} - \frac{9\sin 2x}{4} + \frac{x}{2} - \frac{\sin 6x}{12} - \frac{3\sin 2x}{2} + \frac{\sin 4x}{4} \right]$$

$$= \frac{1}{16} \left[5x - \frac{7\sin 2x}{4} + \frac{3\sin 4x}{4} - \frac{\sin 6x}{12} \right] + C$$

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

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

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

let $u = \cos x$, so $du = -\sin x dx$

$$dx = \frac{-du}{\sin x}$$

$$\sin x$$

$$= \int (u^4 \cdot \frac{-du}{\sin x} \cdot (1 - u^2) \cdot \sin x)$$

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

$$\int (-u^4 + u^6) du$$

$$= \frac{u^5}{5} + \frac{u^7}{7} + C$$

$$= \frac{-7u^5}{35} + \frac{5u^7}{35} + C$$

$$= \frac{-7 \cos x^5 + 5 \cos x^2}{35} + C$$

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

$$u = \sin x, \quad du/dx = \cos x \quad dx = du / \cos x$$

$$\int \cos x - u^3 = \int u^3 du/dx = \frac{u^4}{4} + C = \frac{u^4}{4} + C$$

$$\text{since } u = \sin x$$

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