

19/MHS01/132

MAT ASSIGNMENT

Mark by date (October)

$$1 \int \sin^6 x$$

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

$$\sin^2 x = \frac{1}{2} [1 - \cos 2x]$$

$$\sin^6 x = \left[\frac{1 - \cos 2x}{2} \right]^3$$

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

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

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

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

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

$$\int \sin^6 x = \frac{1}{8} \int \frac{5}{2} - 4\cos 2x + \frac{3\cos 4x}{2} + \cos 2x \sin^2 2x \, dx$$

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

$$\int \sin^6 x = \frac{x}{2} - \frac{\sin 2x}{4} + \frac{3\sin 4x}{64} + \frac{\sin^3 2x}{48} + C$$

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

$$u = \cos x$$

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

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

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

$$\int \cancel{\sin x} \cdot \sin^2 x \cdot u^4 \cdot \frac{du}{\cancel{\sin x}}$$

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

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

$$\int \cos^4 x \sin^3 x = - \int (u^4 - u^6) du$$

$$\int \cos^4 x \sin^3 x = - \left[\frac{u^5}{5} - \frac{u^7}{7} \right] + C$$

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

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

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

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

$$du = \cos x \, dx$$

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

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

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

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

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