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COLLEGE: MEDICAL AND HEALTH SCIENCES

DEPARTMENT: MEDICINE AND SURGERY

MATRIC NUMBER: 19/MHS01/166

COURSE: MAT 104

1 $\int \sin^6 x$

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

integral reduction

$\int \sin^n x = \frac{-\cos x \sin^{n-1} x}{n} + \frac{n-1}{n}\int \sin^{n-2} x$

where $n = 6$

$\int \sin^6 x = \frac{-\cos x \sin^5 x}{6} - \frac{5}{6}\int \sin^4 x$

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

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

$\frac{1}{2}\int 1 - \cos 2x = \frac{1}{2}x - \frac{\sin 2x}{4}$

$\frac{3}{8}x - \frac{3\sin 2x}{16}$

$\frac{5}{6}\left(\frac{-\cos x \sin^3 x}{4} - \frac{3}{8}x - \frac{3\sin 2x}{16}\right)$

$\int \sin^4 x =$

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

2 $\int \cos^4 x \sin^3 x \, dx$

$= \int \cos^4 x \sin^2 x \sin x \, dx$

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

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

$u = \cos x$

$du = -\sin x \, dx$

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

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

$= -\frac{u^5}{5} + \frac{u^6}{6} + C$

$= -\frac{\cos^5 x}{5} + \frac{\cos^6 x}{6} + C$

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

$= \int \cos x \sin^2 x \sin x \, dx$

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

$u = \cos x$

$du = -\sin x \, dx$

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

$= -\int u - u^3 \, du$

$= -\frac{u^2}{2} + \frac{u^4}{4} + C$

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

or

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

$u = \sin x$

$du = \cos x \, dx$

$\int u^3 \, du$

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