DAVOU WENG CHRISTOPHER
19/MHS01/135
MBBS
MAT 104

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

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

Recall that $\sin x = 1 - \cos x$

$\therefore \int (\sin^2 x)^3 dx = \int (1 - \cos^2 x)^3 dx$

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

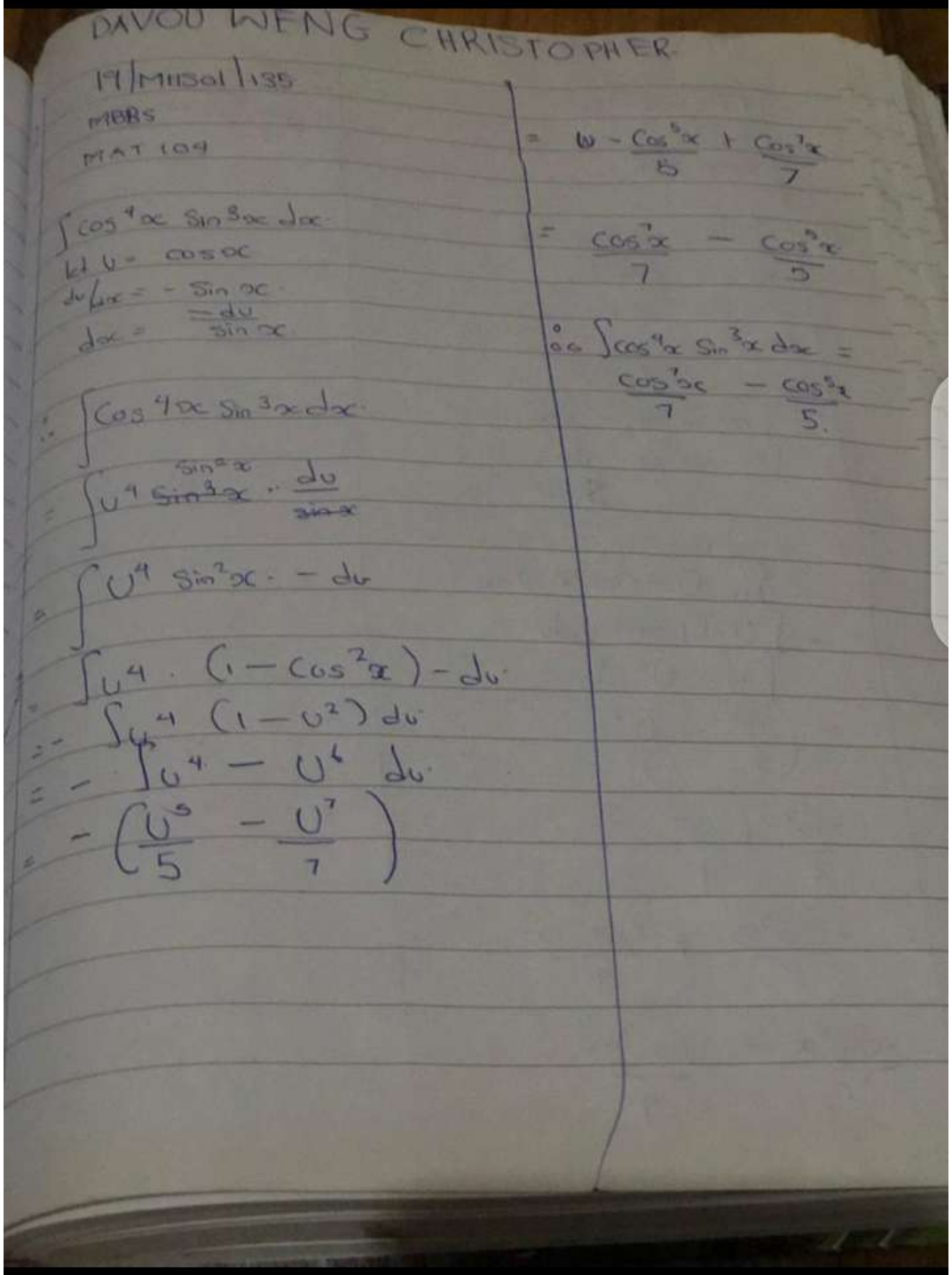
$= \int (1 - \cos^2 x)(1 - 2\cos^2 x + \cos^4 x) dx$

$= \int 1 - 3\int \cos^2 x + \int \cos^4 x - \int \cos^6 x$

$= x - 3\left(\frac{\cos^5 x}{3}\right) + \frac{\cos^5 x}{5} - \frac{\cos^7 x}{7}$

$= x - \cos^3 x + \frac{\cos^5 x}{5} - \frac{\cos^7 x}{7}$

$\therefore \int \sin^6 x \, dx = x - \cos^3 x + \frac{\cos^5 x}{5} - \frac{\cos^7 x}{7}$



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MAT 104

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

let $u = \cos x$

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

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

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

$= \int u^4 \sin^3 x \cdot \frac{du}{\sin x}$ ($\sin^3 x$ to $\sin^2 x$)

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

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

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

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

$= -\left(\frac{u^5}{5} - \frac{u^7}{7}\right)$

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

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

$\therefore \int \cos^4 x \sin^3 x \, dx = \frac{\cos^7 x}{7} - \frac{\cos^5 x}{5}$

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MAT 101

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

let $u = \cos x$

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

$dx = -du/\sin x$

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

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

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

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

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

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

$= -\left(\frac{u^2}{2} - \frac{u^4}{4}\right.$

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

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

$\frac{\cos^2 x}{2} - \frac{\cos^4 x}{4}$

$\therefore \int \cos x \sin^3 x \, dx$
$= \frac{\cos^2 x}{2} - \frac{\cos^4 x}{4}$