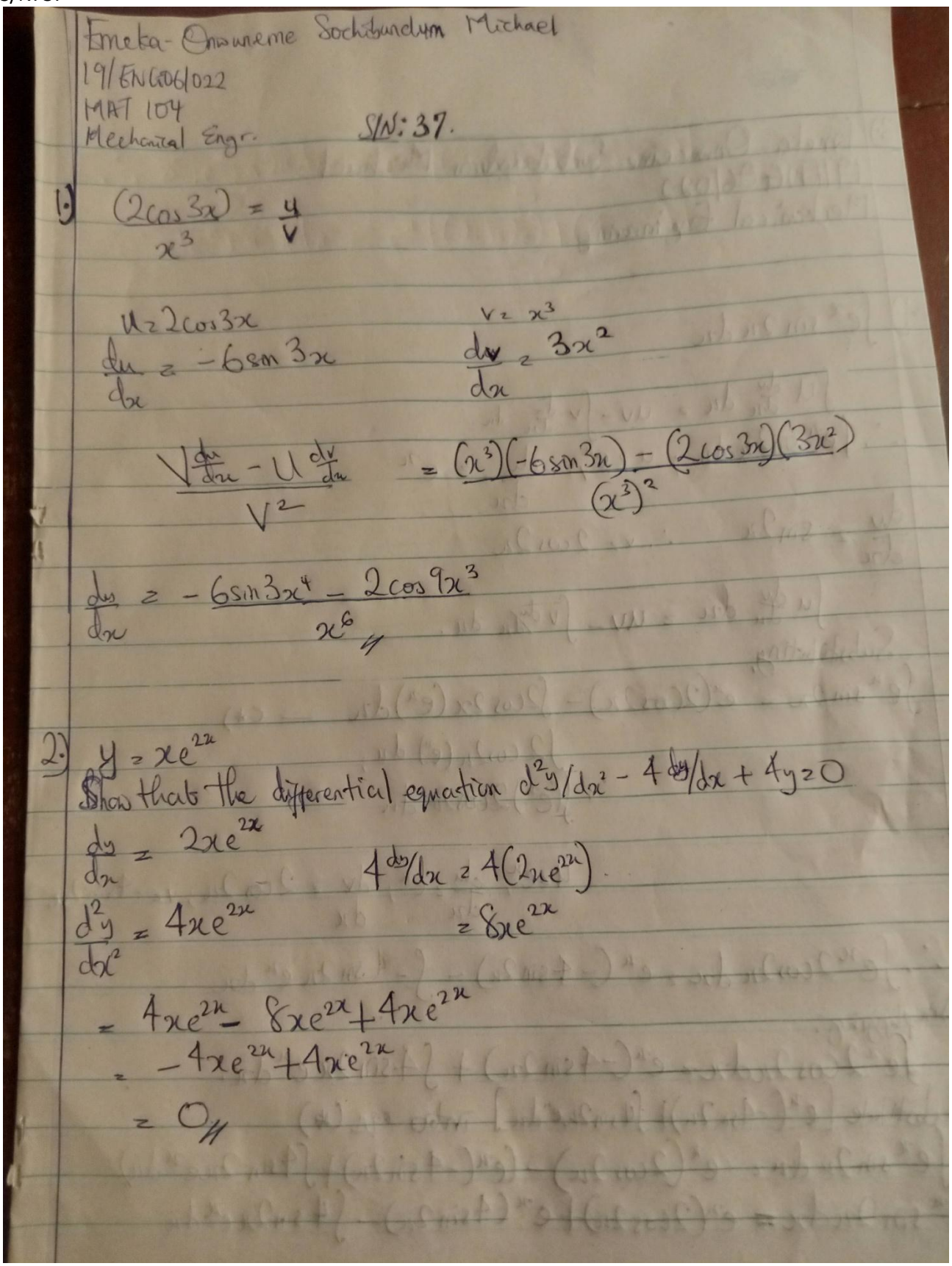
EMEKA-ONWUNEME SOCHIBUNDUM
19/ENG06/022
MECHANICAL ENGINEERING
MATH 104
S/N: 37



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1.) $\frac{(2\cos 3x)}{x^3} = \frac{u}{v}$

$u = 2\cos 3x$ $\quad v = x^3$

$\frac{du}{dx} = -6\sin 3x$ $\quad \frac{dv}{dx} = 3x^2$

$\frac{V\frac{du}{dx} - U\frac{dv}{dx}}{V^2} = \frac{(x^3)(-6\sin 3x) - (2\cos 3x)(3x^2)}{(x^3)^2}$

$\frac{dy}{dx} = \frac{-6\sin 3x^4 - 2\cos 9x^3}{x^6}$ //

2.) $y = xe^{2x}$

Show that the differential equation $d^2y/dx^2 - 4dy/dx + 4y = 0$

$\frac{dy}{dx} = 2xe^{2x}$ $\quad 4dy/dx = 4(2xe^{2x})$

$\frac{d^2y}{dx^2} = 4xe^{2x}$ $\quad = 8xe^{2x}$

$= 4xe^{2x} - 8xe^{2x} + 4xe^{2x}$

$= -4xe^{2x} + 4xe^{2x}$

$= 0$ //

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$$\therefore \frac{5\int e^x \sin 2x\,dx}{5} = \frac{e^x[(2\cos 2x)+(4\sin 2x)]}{5}$$

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3) Emeka-Onwuneme Sochibundum Michael
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4) $\int e^x \sin 2x\, dx$

$\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$

$\therefore \int e^x \sin 2x\, dx$; $u = e^x$, $\frac{du}{dx} = e^x$

$\frac{dv}{dx} = \sin 2x$ $\therefore v = 2\cos 2x$

$\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$.

Substituting,

$\int e^x \sin 2x = e^x(2\cos 2x) - \int 2\cos 2x (e^x) dx$ — (*)

$\int 2\cos 2x (e^x) dx$;

$\therefore \int (e^x) 2\cos 2x\, dx$

$u = e^x$; $\frac{du}{dx} = e^x$; $\frac{dv}{dx} = 2\cos 2x$; $v = -4\sin 2x$

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

Simplifying:

$\int e^x 2\cos 2x\, dx = e^x(-4\sin 2x) + \int 4\sin 2x\, e^x dx$.

Substitute $[e^x(-4\sin 2x) + \int 4\sin 2x e^x dx]$ into eqn (*)

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

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

$\int e^x \sin 2x\, dx + 4\int \sin 2x e^x dx = e^x(2\cos 2x) + e^x(4\sin 2x)$

$5\int e^x \sin 2x\, dx = e^x(2\cos 2x) + e^x(4\sin 2x)$.

Divide through by the coefficient of $\int e^x \sin 2x\, dx$ to get its value.