Uduokhai Samuel Osagie
19/ENG04/057
Elect/Elect
100 Level
Maths 104
Serial no: ~~2005~~ 204

1) $y = \frac{(2\cos 3x)}{x^3}$

$\frac{dy}{dx} = \frac{V\frac{du}{dx} - u\,dv/dx}{V^2}$

$u = 2\cos 3x \qquad V = x^3$

$du/dx = 6\sin 3x \qquad dv/dx = 3x^2 ; \quad V^2 = (x^3)^2 = x^6$

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

$= \frac{-6x^3\sin 3x - 6x^2\cos 3x}{x^6}$

~~$dy/dx =$~~

$dy/dx = \frac{-6x^2(x\sin 3x + \cos 3x)}{x^6}$

$dy/dx = \frac{-6(x\sin 3x + \cos 3x)}{x^4}$

2 $y = xe^{2x}$

$dy/dx = u\,dv/dx + V\,du/dx$

$u = x \qquad V = e^{2x}$

$du/dx = 1 \qquad dv/dx = 2e^{2x}$

$dy/dx = x(2e^{2x}) + e^{2x}(1)$

$dy/dx = 2xe^{2x} + e^{2x}$

(i) $4\,dy/dx = 4(2xe^{2x} + e^{2x})$

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

(ii) $d^2y/dx^2 = (2e^{2x} + e^{2x}) + 2e^{2x}$

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

$d^2y/dx^2 = 4xe^{2x} + 4e^{2x}$

$4y = 4(xe^{2x})$

$4y = 4xe^{2x}$

$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = (4xe^{2x} + 4e^{2x}) - (8xe^{2x} + 4e^{2x}) + (4xe^{2x})$

$\frac{d^2y}{dx^2} = \frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 4xe^{2x} + 4e^{2x} - 8xe^{2x} - 4e^{2x} + 4xe^{2x}$

$d^2y/dx^3 - 4\frac{dy}{dx} + 4y = 4xe^{2x} - 8xe^{2x} + 4xe^{2x} + 4e^{2x} - 4e^{2x}$

$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$

3 Uduokhai Samuel Osagie.
19/ENG04/057.
Electrical Electronics Engineering

4 $\int e^x \sin 2x$

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

$u = \sin 2x \qquad v = e^x$

$du/dx = 2\cos 2x \qquad dv/dx = e^x$

$du = 2\cos 2x\, dx$.

$\int u\, dv = uv - \int u\, du$

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

$\int e^x 2\cos 2x\, dx$.

$u = 2\cos 2x \qquad v = e^x$

$du/dx = -4\sin 2x\, dx \qquad dv/dx = e^x$

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

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

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

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

$5\int \sin 2x\, e^x\, dx = e^x(\sin 2x - 2\cos 2x)$

$\therefore \int \sin 2x\, e\, dx = \frac{e^x(\sin 2x - 2\cos 2x)}{5}$