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MATH 164

200 LEVEL

ELECT/ELEC 07.

1. $\int 8t \cdot e^{2t} dt$

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Integration by part:

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

$u = 8t \quad du = 8dt$

$dv = e^{2t} \quad \therefore v = e^{2t}/2$

$= \frac{8t}{2} e^{2t} - \int \frac{e^{2t}}{2} 8dt$

$= \frac{8t}{2} \cdot e^{2t} - \frac{8}{2} \int e^{2t} dt$

$= 4t e^{2t} - 4 \left[\frac{e^{2t}}{2} \right] + C$

$= 4t e^{2t} - 2 e^{2t} + C$ //.

PJ1

2. $x^2 \sin x$

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

Integration by part

$u = x^2, \quad \frac{du}{dx} = 2x \quad \therefore du = 2x \, dx$

$dv = \sin x \quad \therefore v = -\cos x$

$-x^2 \cos x + 2 \int x \cdot \cos x \, dx$

$-x^2 \cos x + 2 \int x \cdot \cos x \, dx$

$-x^2 \cos x + 2 \left[x \sin x - \int 1 \cdot \sin x \, dx \right]$

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

$-x^2 \cos x + 2x \sin x + 2 \cos x + C$

$= \cos x \left[2 - x^2 \right] + 2x \sin x + C$ //.

Q. If $2y^2 - 5x^4 - 2 - 4y^2 = 0$, find df/dx

Implicit function.

Collect like terms.

$2y^2 - 4y^2 = 5x^4 + 2$

$4y\, df/dx - 4y\, df/dx = 20x^3$

$(4y - 4y)\, df/dx = 20x^2$

$df/dx = \frac{20x^2}{4y - 4y} = \frac{20x^2}{(4-4)y}$

$\frac{df}{dx} = \frac{20x^3}{-10y}$.

Pg2.

Q. $4x^2 + 2xy^3 - 5y^2 = 0$

$4.2x + 2x.3y^2\, df/dx + 2y^3 - 5.2y\, df/dx = 0$.

$8x + 2y^3 + (6xy - 10y)\, df/dx = 0$

$8x + 2y^3 = -(6xy^2 - 10y)\, df/dx$

$8x + 2y^3 = (10y - 6xy^2)\, df/dx$.

$\frac{df}{dx} = \frac{8x + 2y^3}{10y - 6xy^2}$

At $x = 1, y = 2$

$= \frac{8(1) + 2(2)^3}{10(2) - 6(1)(2)}$

$= \frac{8 + 16}{20 - 12} = \frac{24}{8}$

$df/dx = 3$.