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19/ENG06/031

MATH104

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MECHANICAL ENGINEERING

MATH104

$$1) \int 3te^{2t} dt$$

$$u = 3t \quad du = e^{2t}$$

$$du = 2t \quad v = \frac{1}{2}e^{2t}$$

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

$$= \frac{3}{2}te^{2t} - \frac{3}{2} \int e^{2t} dt$$

$$\frac{3te^{2t}}{2} - \frac{3}{2} \left[\frac{e^{2t}}{2} \right] + C$$

$$= \frac{3te^{2t}}{2} - \frac{3e^{2t}}{4} + C$$

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

$$u = x^2 \quad dv = \sin x$$

$$du = 2x dx \quad v = -\cos x$$

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

$$= -x^2 \cos x - \int -2x \cos x dx$$

$$u = 2x \quad dv = \cos x$$

$$2x \sin x - \int 2 \sin x dx$$

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

$$(3) \int \sin 7x \cos 2x dx$$

$A = 7x \quad B = 2x$

$$\sin A \cos B = \frac{1}{2} [\sin(A+B) + \sin(A-B)]$$

$$\frac{1}{2} [\sin 9x + \sin 5x]$$

$$\int \sin 7x \cos 2x dx = \int \frac{1}{2} [\sin 9x + \sin 5x] dx$$

$$= \frac{1}{2} \left[\frac{-\cos 9x}{9} - \frac{\cos 5x}{5} \right] + C$$

$$(4) \int \frac{2x - 3x^2}{1-x} dx$$

$$= \int \frac{-3x^2 + 2x}{-x} dx$$

$$\int \frac{(3x^2 - 2x) dx}{(x-1)}$$

$$x=1 \quad \frac{3x+1}{\sqrt{3x^2-2x}}$$

$$\frac{3x^2-3x}{x}$$

$$= \int (3x+1) dx + \int \frac{1}{x-1} dx$$

$$= \frac{3x^2}{2} + x + \ln|x-1| + C$$