

JACK MERITON EMMANUEL MAT 104 ASSIGNMENT

19/MHS 01/213

Integrate the following

1) $2x^2 \ln x$

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

$$du = \frac{1}{x} dx \quad v = \frac{2x^3}{3}$$

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

$$= \ln x \frac{2x^3}{3} - \int \frac{1}{x} \cdot \frac{2x^3}{3} dx$$

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

$$= \ln x \frac{2x^3}{3} - \frac{2x^3}{9} + C = \frac{2x^3}{3} \left(\ln x - \frac{1}{3} \right) + C$$

2) $3t e^{2t}$

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

$$du = 3 dt \quad v = \frac{e^{2t}}{2}$$

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

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

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

3) $x^2 \sin x$

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

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

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

$$\begin{cases} du = 2x dx & v = \sin x \\ u = 2x & dv = \cos x \end{cases}$$

$$\begin{aligned}
 &= 2x \sin x - \int \sin x \cdot 2 dx \\
 &= -x^2 \cos x + 2x \sin x \\
 &= -x^2 \cos x + 2x \sin x
 \end{aligned}$$

④ $\cos 5x \cos 6x$

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

$$A = 5x \quad B = 6x$$

$$\int \cos 5x \cos 6x dx = \int \frac{1}{2} [\cos 11x - \cos x]$$

$$= \frac{1}{2} \frac{\sin 11x}{11} + \sin x$$

$$= \frac{\sin 11x}{22} + \frac{\sin x}{2} + C$$

⑤ $\sin 7x \cos 2x$

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

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

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

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

$$= \frac{\sin 9x}{18} + \frac{\sin 5x}{10}$$