

$$3.) \int \sin 7x \cos 2x$$

$$\text{let } A = 7x, B = 2x$$

$$\int \sin 7x \cos 2x = \frac{1}{2} [\sin (7x + 2x) + \sin (7x - 2x)]$$

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

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

$$= \frac{\cos 9x}{18} - \frac{\cos 5x}{10} + C$$

$$4.) \frac{2x - 3x^2}{1 - x}$$

$$1 - x \overline{) 2x - 3x^2}$$

$$\underline{2x - 2x^2}$$

$$-x^2$$

$$\underline{-x^2 + x^3}$$

$$-x^3$$

which can now be

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

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

1.) $3te^{2t}$

Solution

Let $u = 3t$ and $du = e^{2t}$

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

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

$$\text{Using } uv - \int v du = \int u dv \\ = 3t \left(\frac{e^{2t}}{2} \right) - \int \frac{e^{2t}}{2} \times 3 dt$$

$$3t \left(\frac{e^{2t}}{2} \right) - \frac{1}{2} \int 3e^{2t} dt$$

$$3t \left(\frac{e^{2t}}{2} \right) - \frac{1}{2} \times \frac{3e^{2t}}{2} + C$$

$$\left[\frac{3}{2} te^{2t} - \frac{3e^{2t}}{4} \right] + C$$

2.) $3x^2 \sin x$

Let $u = x^2 = du = 2x dx$

$$\frac{du}{dx} = 2x = v = -\cos x$$

$$\frac{d}{dx} \text{ using } uv - \int v du \\ (x^2)(-\cos x) - \int (-\cos x)(2x dx)$$

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

$$\left[\text{Let } u = -2x \text{ and } du = -2 dx \right]$$

$$\therefore (-2x)(\sin x) - \int (\sin x)(-2) dx$$

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

$$= -2x \sin x - (-2) - \cos x + C$$

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

$$\therefore \int 3x^2 \sin x = -x^2 \cos x - 2x \sin x + 2 \cos x + C$$