ASSIGNMENT

(1) $x^2 \sin x \, dx$

Solution

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

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

$du = 2x \, dx \qquad v = -\cos x$

$$\int u \, dv = uv - \int v \, du$$
$$= x^2(-\cos x) - \int (-\cos x)(2x) \, dx$$
$$= -x^2 \cos x - \int -2x \cos x \, dx$$

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

$u = -2x \qquad dv = \cos x$

$du = -2 \, dx \qquad v = \sin x$

$$\int u \, dv = uv - \int v \, du$$
$$= (-2x)(\sin x) - \int (\sin x)(-2) \, dx$$
$$= -2x \sin x - \int -2 \sin x \, dx$$
$$= -2x \sin x - (-2) \int \sin x \, dx$$
$$= -2x \sin x + 2 \int \sin x \, dx$$
$$= -2x \sin x + 2(-\cos x)$$
$$= -2x \sin x - 2 \cos x$$

$$\therefore \int x^2 \sin x \, dx = -x^2 \cos x - [-2x \sin x - 2 \cos x]$$
$$= -x^2 \cos x + 2x \sin x + 2 \cos x + C$$

4

$$= -3\ln(1-x) + 6(1-x) - \frac{3(1-x)^2}{2}$$

$$= -3\ln(1-x) + \frac{6(1-x)}{1} - \frac{3(1-2x+x^2)}{2}$$

$$= -3\ln(1-x) + \frac{(6\times2)(1-x) - 3(1-2x+x^2)}{2}$$

$$= -3\ln(1-x) + \frac{12(1-x) - (3-6x+3x^2)}{2}$$

$$= -3\ln(1-x) + \frac{12-12x-3+6x-3x^2}{2}$$

$$\int \frac{3x^2}{1-x}\,dx = -3\ln(1-x) + \frac{9-6x-3x^2}{2}$$

4

So,

$$\int \frac{2x}{1-x}\,dx - \int \frac{3x^2}{1-x}\,dx = -2\ln(1-x) + 2 - 2x - \left[-3\ln(1-x) + \frac{9-6x-3x^2}{2}\right]$$

$$= -2\ln(1-x) + 2 - 2x + 3\ln(1-x) \frac{-9+6x+3x^2}{2}$$

$$= \frac{2-2x}{1} \frac{-9+6x+3x^2}{2} - 2\ln(1-x) + 3\ln(1-x)$$

$$= \frac{2(2-2x) - 9 + 6x + 3x^2}{2} + \ln(1-x) + C$$

$$= \frac{4-4x-9+6x+3x^2}{2} + \ln(1-x) + C$$

$$\int \frac{2x-3x^2}{(1-x)}\,dx = \frac{3x^2+2x-5}{2} + \ln(1-x) + C$$