NAME: OJO-ONI DANIEL OLUWASEGUN, MATRIC NO.; 19/ENG09/016, DEPARTMMENT; AERONAUTICAL ENGINEERING, COURSE, MAT 104 GENERAL MATHEMATICS III, LECTURER; DR. OYELAMI, DATE SUBMITTED; 25th OF APRIL, 2020.

NAME: OJO-ONI DANIEL OLUWASEGUN , MATRIC NO: 19/ENG09/016.
MAT 104 , GENERAL MATHEMATICS III ASSIGNMENT FOR DR. OYELAMI
GROUP. DEPARTMENT: AERONAUTICAL ENGINEERING. DATE: 25/4/20
LECTURER: DR. OYELAMI.

QUESTIONS AND ANSWERS.

Find the integral of the following:

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

Solution

$x^2 \sin x \, dx$

$\int x^2 \sin x \, dx = uv - \int v \, du$.

let $u = x^2$, $du = 2x \, dx$, $dv = \sin x$, $v = -\cos x$

$\therefore =$ substituting.

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

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

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

$-x^2 \cos x + 2x \sin x - (-2 \cos x)$.

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

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

solution:

Given $3t e^{2t}$

$\int 3t e^{2t} \, dt$.

Recall that

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

where $u = t$, $dv = e^{2t}$, $du = dt$, $\int dv = \int e^{2t}$

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

substituting:

$= t \cdot \frac{1}{2} e^{2t} - \int \frac{1}{2} e^{2t} \cdot dt$

$= \frac{1}{2} t e^{2t} - \frac{1}{2} \int e^{2t} \cdot dt$.

NAME: OJO-ONI DANIEL OLUWASEGUN, MATRIC NO.; 19/ENG09/016, DEPARTMMENT; AERONAUTICAL ENGINEERING, COURSE, MAT 104 GENERAL MATHEMATICS III, LECTURER; DR. OYELAMI, DATE SUBMITTED; 25thOF APRIL, 2020.

This will give us $= \frac{1}{2}te^{2t} - \frac{1}{4}e^{2t} + c.$

$$3\left(\tfrac{1}{2}te^{2t} - \tfrac{1}{4}e^{2t} + c\right) = \frac{3}{2}te^{2t} - \frac{3e^{2t}}{4} + c$$

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

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

solution:

$\int \sin 7x \cos 2x$

Recall: $\sin a \cdot \cos b = \frac{1}{2}\left(\sin(a+b) + \sin(a-b)\right)$

$\sin(7x)\cos(2x) = \frac{1}{2}\left(\sin 9x + \sin 5x\right).$

$= \frac{1}{2}\int \sin(9x)\,dx + \int \frac{1}{2}\sin(5x)\,dx.$

$= \frac{1}{2}\left(-\frac{\cos 9x}{9}\right) + \frac{1}{2}\left(-\frac{\cos(5x)}{5}\right) + c.$

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

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

Solution:

Given $\frac{2x-3x^2}{1-x}$, $\int \frac{2x-3x^2}{1-x}\,dx$

$= \int \frac{u}{1-x} \times \frac{du}{2-6x}$

let $u = 2x - 3x^2$

$du = 2 - 6x\,dx.$

$dx = \frac{du}{2-6x}.$

NAME: OJO-ONI DANIEL OLUWASEGUN, MATRIC NO.; 19/ENG09/016, DEPARTMMENT; AERONAUTICAL ENGINEERING, COURSE, MAT 104 GENERAL MATHEMATICS III, LECTURER; DR. OYELAMI, DATE SUBMITTED; 25th OF APRIL, 2020.

$$\int \frac{4}{(1-x)(2-6x)}\,du = \int \frac{A}{(1-x)} + \frac{B}{(2-6x)}$$

multiply through by $(1-x)(2-6x)$

$$2x - 3x^2 = (2-6x)A + B(1-x).$$

when $x = 1$, when $x = 1/3$

$-1 = -4A$ $\quad 1/3 = 2/3\,B$

$A = 1/4$ $\quad B = 1/2$

$$\int 4(1-x) + \int 2(2-6x)$$

$$-\frac{4}{2}x - \frac{2}{2}x + C.$$

$\therefore$ simplifying

$$= -2x - x + C.$$

$$= -3x + C$$