PROGRAM STUDI MAGISTER TEKNIK SIPIL,

UNIVERSITAS BINA DARMA

UJIAN TENGAH SEMESTER

Mata Kuliah: Komputer & Simulasi
Hari Tanggal: Sabtu 26 Desember 2020
Dosen : Ir. Nurly Gofar, MSCE., PhD & Alfrendo Satyanaga, ST, MSc., PhD

<u>Soal 1</u>

a) Seperti yang telah kami jelaskan pada Kuliah 7 dan 8, sebutkan keunggulan penggunaan Software sebagai alat (Tool) dalam pengerjaan perhitungan yang berulang.

b) Sebutkan satu contoh perhitungan berulang (dalam bidang Teknik Sipil) yang sebaiknya di analisis menggunakan software.

<u>Soal 2</u>

a) Sebutkan perbedaan antara Limit Equilibrium Method / Metode Kesetimbangan Batas (LEM) dan Finite Element Method / Metode Elemen Hingga (FEM)

b) Jelaskan juga perbedaan antara Finite Element Method / Metode Elemen Hingga (FEM) dan Finite Difference Method / Metode Beda Hingga (FDM)

<u>Soal 3</u>

a) Berdasakan Kuliah 2, sebutkan elemen pemodelan Numerik untuk analisis statik konstruksi sipil
b) Bagaimana mendapatkan informasi mengenai pembebanan dan kekakuan sistem struktur.

<u>Soal 4</u>

Jelaskan tentang kelakukan bahan Elastis? Plastis? GAMBARKAN hubungan tegangan regangan untuk bahan elasto-plastis (lengkapi dengan keterangan)

<u>Soal 5</u>

Jelaskan tahapan tahapan dalam pemodelan Numerik (apabila membuat sendiri Program)

Selamat Bekerja

PERTEMUAN KE 8 INTEGRAL

Tugas : Selesaikan Integral berikut :

a). $\int_{-3}^{3}\int_{0}^{x}(x^2-y^3)\,dy\,dx$

$= \int_{-3}^{3}\left(x^2\frac{1}{0+1}y^{0+1}-\frac{1}{3+1}y^{3+1}\right]_0^x dx$

$= \int_{-3}^{3}\left(x^2y-\frac{1}{4}y^4\right)_0^x dx$

$= \int_{-3}^{3}\left(x^2(x)-\frac{1}{4}(x)^4\right)-\left(x^2(0)-\frac{1}{4}(0)^4\right)dx$

$= \int_{-3}^{3}\left(x^3-\frac{1}{4}x^4\right)dx$

$= \left(\frac{1}{3+1}x^{3+1}-\frac{1/4}{4+1}x^{4+1}\right)_{-3}^{3}$

$= \left(\frac{1}{4}x^4-\frac{1/4}{5/1}x^5\right)_{-4}^{3}$

$= \left(\frac{1}{4}x^4-\frac{1}{9}x^2\right)_{-3}^{3}$

$= \left(\frac{1}{4}(3)^4-\frac{1}{9}(3)^5\right)-\left(\frac{1}{4}(-3)^4-\frac{1}{9}(-3)^5\right)$

$= \left(\frac{1}{4}(81)-\frac{1}{9}(243)\right)-\left(\frac{1}{4}(81)-\frac{1}{9}(-243)\right)$

$= \left(\frac{81}{4}-\frac{243}{9}\right)-\left(\frac{81}{4}+\frac{243}{9}\right)$

$= \cancel{\frac{81}{4}}-\frac{243}{9}-\cancel{\frac{81}{4}}-\frac{243}{9}$

$= -\frac{486}{9} \Rightarrow \frac{162}{3}$

$= \boxed{-54}$

2

b/. $\int_1^5 \int_0^x \frac{3}{x^2+y^2}\,dy\,dx.$

$= \int_1^5 \int_0^x \frac{3}{y^2/\sin^2\theta}\,dy\,dx.$

$= \int_1^5 \int_0^x \frac{3\sin^2\theta}{y^2}\,dy\,dx.$

$= \int_1^5 \left(3\sin^2\theta \cdot \frac{1}{-2+1}\, y^{-2+1}\right)_0^x dx$

$= \int_1^5 \left(\frac{3\sin\theta g}{-1}\, y^{-1}\right)_0^x dx$

$= \int_1^5 \left(\frac{-3\sin\theta y}{y}\right)_0^x dx$

$= \int_1^5 \left(\frac{-3\sin\theta x}{x}\right) - \left(\frac{-3\sin.(0)}{0}\right) dx$

$= \int_1^5 -3\sin\theta\, dx$

$= \left(-3\sin\theta \frac{1}{0+1} x^{0+1}\right)_1^5$

$= \left(-3\sin\theta \frac{1}{1} x^1\right)_1^5$

$= \left(-3\sin\theta \cdot x\right)_1^5$

$= \left(-3\sin\theta(5)\right) - \left(-3\sin\theta\cdot(1)\right)$

$= \left(-15\sin\theta\right) - \left(-3\sin\theta\right)$

$= -15\sin\theta + 3\sin\theta$

$= \boxed{-12\sin\theta}$

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c). $\int_0^{\pi/2} \int_0^{z} \int_0^{y} \sin(x+y+z)\, dx\, dy\, dz$

$$= \int_0^{\pi/2} \int_0^{z} \left(-\cos(x+y+z)\right)_0^{y}\, dy\, dz$$

$$= \int_0^{\pi/2} \int_0^{z} \left(-\cos(y+y+z) - (-\cos(0+y+z))\right) dy\, dz$$

$$= \int_0^{\pi/2} \int_0^{z} \left(-\cos(2y+z) + \cos(y+z)\right) dy\, dz$$

$$= \int_0^{\pi/2} \left(\frac{-\sin(2y+z)}{2} + \sin(y+z)\right)_0^{z} dz$$

$$= \int_0^{\pi/2} \left(\frac{-\sin(2z+z)}{2} + \sin(z+z) - \left(\frac{-\sin(0+z)}{2} + \sin(0+z)\right)\right) dz$$

$$= \int_0^{\pi/2} \left(\frac{-\sin 3z + \sin z}{2} + \sin 2z\right) dz$$

$$= \left(\frac{\cos 3z + (-\cos z)}{6} + \frac{(-\cos 2z)}{2}\right)_0^{\pi/2}$$

$$= \boxed{\frac{1}{3}}$$

Tayapura.

Nim: 2027001D

Kalkulus Peubah Banyak (Jek makmun)

Soal :

1 Selesaikanlah integral berikut :

a. $\int_{-3}^{3} \int_{0}^{x} (x^2 - y^3)\, dy\, dx$

b. $\int_{1}^{5} \int_{0}^{x} \frac{3}{x^2+y^2}\, dy\, dx$

c. $\int_{0}^{\pi/2} \int_{0}^{z} \int_{0}^{y} \sin (x+y+z)\, dx\, dy\, dz$

* Pembahasan dan Jawaban *

a). $\int_{-3}^{3} \int_{0}^{x} (x^2 - y^3)\, dy\, dx$

$= \int_{-3}^{3} \left[x^2 \cdot \frac{1}{0+1} y^{0+1} - \frac{1}{3+1} y^{3+1} \right]_0^x dx$

$= \int_{-3}^{3} \left[x^2 y - \frac{1}{4} y^4 \right]_0^x dx$

$= \int_{-3}^{3} \left[x^2 \cdot (x) - \frac{1}{4} (x)^4 \right] - \left[x^2 (0) - \frac{1}{4} (0)^4 \right] dx$

$= \int_{-3}^{3} \left(x^3 - \frac{1}{4} x^4 \right) dx$

$= \left[\frac{1}{3+1} x^{3+1} - \frac{\frac{1}{4}}{4+1} x^{4+1} \right]_{-3}^{3}$

$= \left(\frac{1}{4} x^4 - \frac{\frac{1}{4}}{\frac{5}{1}} x^5 \right)_{-3}^{3}$

$= \left(\frac{1}{4} x^4 - \frac{1}{9} x^5 \right)_{-3}^{3}$

$\left(\frac{1}{4} (-3)^4 - \frac{1}{9} (-3)^5 \right)$

$= \left(\frac{1}{4} (3)^4 - \frac{1}{9} (3)^5 \right) - \left(\frac{1}{4} (81) - \frac{1}{9} (-243) \right)$

$= \left(\frac{1}{4} (81) - \frac{1}{9} (243) \right) - \left(\frac{81}{4} + \frac{243}{9} \right)$

$= \left(\frac{81}{4} - \cancel{\frac{1}{9}} \frac{243}{9} \right) - \left(\frac{81}{4} + \frac{243}{9} \right)$

$= \cancel{\frac{81}{4}} - \frac{243}{9} - \cancel{\frac{81}{4}} - \frac{243}{9}$

$= - \frac{486}{9} \Rightarrow - \frac{162}{3} = -54$

b) $\int_1^5 \int_0^x \frac{3}{x^2+y^2}\, dy\, dx$

$= \int_1^5 \int_0^x \frac{3}{\left(\frac{y^2}{\sin^2\theta}\right)}\, dy\, dx$

$= \int_1^5 \int_0^x \frac{3\sin^2\theta}{y^2}\, dy\, dx$

$= \int_1^5 \left[3\sin^2\theta \cdot \frac{1}{-2+1}\, y^{-2+1}\right]_0^x dx$

$= \int_1^5 \left(\frac{3\sin\theta y}{-1}\, y^{-1}\right)_0^x dx$

$= \int_1^5 \left(\frac{-3\sin\theta y}{y}\right)_0^x dx$

$= \int_1^5 \left(\frac{-3\sin\theta \cancel{x}}{\cancel{x}}\right) - \left(\frac{-3\sin\theta.(0)}{0}\right) dx$

$= \int_1^5 -3\sin\theta\, dx$

$= \left[-3\sin\theta \cdot \frac{1}{\theta+1}\, x^{0+1}\right]_1^5$

$= \left[-3\sin\theta \cdot \frac{1}{1}\, x^1\right]_1^5$

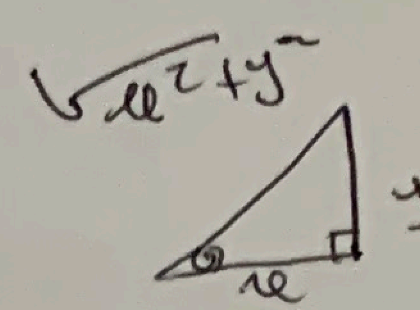
$= \left(-3\sin\theta .\ x\right]_1^5$

$= (-3\sin\theta.(5)) - (-3\sin\theta.(1))$

$= (-15\sin\theta) - (-3\sin\theta)$

$= -15\sin\theta + 3\sin\theta$

$= \underline{\underline{-12\sin\theta}}$



$\sin\theta = \frac{y}{\sqrt{x^2+y^2}}$

$\sqrt{x^2+y^2} = \frac{y}{\sin\theta}$

$\boxed{x^2+y^2 = \frac{y^2}{\sin^2\theta}.}$

John Harles HG. SG. MM.

c). $\int_0^{\pi/2}\int_0^{z}\int_0^{y} \sin(x+y+z)\,dx\,dy\,dz$

$= \int_0^{\pi/2}\int_0^{z} \left(-\cos(x+y+z)\right)_0^{y}\,dy\,dz$

$= \int_0^{\pi/2}\int_0^{z} \left(-\cos(y+y+z) - (-\cos(0+y+z))\right)dy\,dz$

$= \int_0^{\pi/2} \left[-\frac{\sin(2y+z)}{2} + \sin(y+z)\right]_0^{z} dz$

$= \int_0^{\pi/2} \left(-\frac{\sin(2z+z)}{2} + \sin(z+z) - \left(-\frac{\sin(0+z)}{2} + \sin(0+z)\right)\right)dz$

$= \int_0^{\pi/2} \left(\frac{-\sin 3z + \sin z}{2} + \sin 2z\right) dz$

$= \left[\frac{\cos 3z + (-\cos z)}{6} + \left(\frac{-\cos 2z}{2}\right)\right)_0^{\pi/2}$

$= 1/3$

John Harus HG, SG MM

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① SELESAIKAN

ⓐ $\int_{-3}^{3}\int_{0}^{x} (x^2 - y^2)\, dy\, dx$

$= \int_{-3}^{3} \left[x^2 y - \frac{1}{3} y^3 \right]_0^x dx$

$= \int_{-3}^{3} \left[\left(x^2(x) - \frac{1}{3}(x)^3 \right) - 0 \right] dx$

$= \int_{-3}^{3} x^3 - \frac{1}{3} x^3 \, dx$

$= \int_{-3}^{3} \frac{2}{3} x^3 \, dx$

$= \frac{2}{3} \int_{-3}^{2} x^3 \, dx$

$= \frac{2}{3} \left[\frac{1}{4} x^4 \right]_{-3}^{3}$

$= \frac{2}{3} \left(\frac{1}{4}(3)^4 - \frac{1}{4}(-3)^4 \right)$

$= \frac{2}{3} (0) = 0$

Dipindai dengan CamScanner

(b) $\displaystyle\int_1^5\int_0^x \frac{3}{x^2+y^2}\,dy\,dx =$

$$= 3\int_1^5\left(\int_0^x \frac{1}{x^2}\,dy + \int_0^x \frac{1}{y^2}\,dy\right)dx$$

$$= 3\int_1^5 \left[\frac{y}{x^2} + \left(-\frac{1}{y}\right)\right]_0^x dx$$

$$= 3\int_1^5 \left[\left(\frac{\cancel{x}}{\cancel{x^2}_{x}} - \frac{1}{x}\right) - 0\right] dx$$

$$= 3\int_1^5 0\,dx$$

$$= 3 \cdot 0 = 0$$

(c) $\displaystyle\int_0^{\pi/2}\int_0^z\int_0^y \sin(x+y+z)\,dx\,dy\,dz$

$$= \int_0^{\pi/2}\int_0^z \left[\int_0^y \sin(x+y+z)\,dx\right] dy\,dz$$

$$= \int_0^{\pi/2}\int_0^z \left[-\cos(x+y+z)\right]_0^y dy\,dz$$

$$= \int_0^{\pi/2}\int_0^z \left[(-\cos(y+y+z)) - (-\cos(0+y+z))\right] dy\,dz$$

$$= \int_0^{\pi/2}\int_0^z (-\cos(2y+z) + \cos(y+z))\,dy\,dz$$

$$= \int_0^{\pi/2}\left[-\int_0^z \cos(2y+z)\,dy + \int_0^z \cos(y+z)\,dy\right]dz$$

$$= \int_0^{\pi/2}\left[-\frac{\sin(2y+z)}{2} + \sin(y+z)\right]_0^z dz.$$

Dipindai dengan CamScanner

$$= \int_0^{\pi/2} \left[\left(\frac{\sin(2z+z)}{2} + \sin(z+z) \right) - \left(-\frac{\sin(2.0+z)}{2} + \sin(0+z) \right) \right] dz$$

$$= \int_0^{\pi/2} \left(-\frac{\sin(3z) + \sin z}{2} + \sin 2z \right) dz$$

$$= -\int_0^{\pi/2} \frac{\sin(3z) + \sin z}{2}\, dz + \int_0^{\pi/2} \sin(2z)\, dz$$

$$= \left[\frac{\cos(3z)}{6} + \frac{\cos(z)}{2} + \left(-\frac{\cos(2z)}{2} \right) \right]_0^{\pi/2}$$

$$= \left[\frac{\cos(3z)}{6} + \frac{\cos(z) - \cos(2z)}{2} \right]_0^{\pi/2}$$

$$= \left[\left(\frac{\cos(3 \cdot \frac{\pi}{2})}{6} + \frac{\cos(\frac{\pi}{2}) - \cos(2 \cdot \frac{\pi}{2})}{2} \right) - \left(\frac{\cos(3 \cdot 0)}{6} + \frac{\cos(0) - \cos(2 \cdot 0)}{2} \right) \right]$$

$$= \left(\frac{\cos(\frac{3\pi}{2})}{6} + \frac{\cos(\frac{\pi}{2}) - \cos(\pi)}{2} \right) - \left(\frac{\cos(0)}{6} + \frac{\cos(0) - \cos(0)}{2} \right)$$

$$= \frac{0}{6} + \frac{0 - (-1)}{2} - \left(\frac{1}{6} + \frac{0 + 0}{2} \right)$$

$$= 0 + \frac{1}{2} - \left(\frac{1}{6} + 0 \right)$$

$$= \frac{1}{2} - \frac{1}{6}$$

$$= \frac{1}{3} \,//$$

Dipindai dengan CamScanner

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MATEMATIKA TERAPAN
PARI: 8.

① SELESAIKAN

ⓐ $\int_{-3}^{3}\int_{0}^{x} (x^2 - y^2)\, dy\, dx$

$= \int_{-3}^{3} \left[x^2 y - \frac{1}{3} y^3 \right]_0^x dx$

$= \int_{-3}^{3} \left[\left(x^2(x) - \frac{1}{3}(x)^3 \right) - 0 \right] dx$

$= \int_{-3}^{3} x^3 - \frac{1}{3} x^3\, dx$

$= \int_{-3}^{3} \frac{2}{3} x^3\, dx$

$= \frac{2}{3} \int_{-3}^{3} x^3\, dx$

$= \frac{2}{3} \left[\frac{1}{4} x^4 \right]_{-3}^{3}$

$= \frac{2}{3} \left(\frac{1}{4}(3)^4 - \frac{1}{4}(-3)^4 \right)$

$= \frac{2}{3}(0) = 0$

(b) $\int_1^5 \int_0^x \frac{3}{x^2+y^2} \, dy \, dx =$

$$= 3\int_1^5 \left(\int_0^x \frac{1}{x^2} \, dy + \int_0^x \frac{1}{y^2} \, dy \right) dx$$

$$= 3\int_1^5 \left[\frac{y}{x^2} + \left(-\frac{1}{y} \right) \right]_0^x dx$$

$$= 3\int_1^5 \left[\left(\frac{\cancel{x}}{\cancel{x^2}_x} - \frac{1}{x} \right) - 0 \right] dx$$

$$= 3\int_1^5 0 \, dx$$

$$= 3 \cdot 0 = 0$$

(c) $\int_0^{\pi/2} \int_0^z \int_0^y \sin(x+y+z) \, dx \, dy \, dz$

$$= \int_0^{\pi/2} \int_0^z \left[\int_0^y \sin(x+y+z) \, dx \right] dy \, dz$$

$$= \int_0^{\pi/2} \int_0^z \left[-\cos(x+y+z) \right]_0^y dy \, dz$$

$$= \int_0^{\pi/2} \int_0^z \left[(-\cos(y+y+z) - (-\cos(0+y+z)) \right] dy \, dz$$

$$= \int_0^{\pi/2} \int_0^z (-\cos(2y+z) + \cos(y+z)) \, dy \, dz$$

$$= \int_0^{\pi/2} \left[-\int_0^z \cos(2y+z) \, dy + \int_0^z \cos(y+z) \, dy \right] dz$$

$$= \int_0^{\pi/2} \left[-\frac{\sin(2y+z)}{2} + \sin(y+z) \right]_0^z dz.$$

$$= \int_0^{\pi/2} \left[\left(\frac{\sin(2z+z)}{2} + \sin(z+z) \right) - \left(-\frac{\sin(2.0+z)}{2} + \sin(0+z) \right) \right] dz$$

$$= \int_0^{\pi/2} \left(-\frac{\sin(3z) + \sin z}{2} + \sin 2z \right) dz$$

$$= -\int_0^{\pi/2} \frac{\sin(3z) + \sin z}{2} \, dz + \int_0^{\pi/2} \sin(2z) \, dz$$

$$= \left[\frac{\cos(3z)}{6} + \frac{\cos(z)}{2} + \left(-\frac{\cos(2z)}{2} \right) \right]_0^{\pi/2}$$

$$= \left[\frac{\cos(3z)}{6} + \frac{\cos(z) - \cos(2z)}{2} \right]_0^{\pi/2}$$

$$= \left[\left(\frac{\cos(3 \cdot \frac{\pi}{2})}{6} + \frac{\cos(\frac{\pi}{2}) - \cos(2 \cdot \frac{\pi}{2})}{2} \right) - \left(\frac{\cos(3 \cdot 0)}{6} + \frac{\cos(0) - \cos(2 \cdot 0)}{2} \right) \right]$$

$$= \left(\frac{\cos(\frac{3\pi}{2})}{6} + \frac{\cos(\frac{\pi}{2}) - \cos(\pi)}{2} \right) - \left(\frac{\cos(0)}{6} + \frac{\cos(0) - \cos(0)}{2} \right)$$

$$= \frac{0}{6} + \frac{0 - (-1)}{2} - \left(\frac{1}{6} + \frac{0 + 0}{2} \right)$$

$$= 0 + \frac{1}{2} - \left(\frac{1}{6} + 0 \right)$$

$$= \frac{1}{2} - \frac{1}{6}$$

$$= \frac{1}{3}$$

1. a. $\int_{-3}^{3}\int_{0}^{x}(x^2-y^3)\,dy\,dx$

$$\int_{-3}^{3}\left[x^2\cdot\frac{1}{0+1}y^{0+1}-\frac{1}{3+1}y^{3+1}\right]_0^x dx$$

$$\int_{-3}^{3}\left[x^2y-\frac{1}{4}y^4\right]_0^x dx$$

$$\int_{-3}^{3}\left[x^2\cdot x-\frac{1}{4}x^4\right]-\left[x^2(0)-\frac{1}{4}(0)^4\right]dx$$

$$\int_{-3}^{3}\left(x^3-\frac{1}{4}x^4\right)dx$$

$$\left[\frac{1}{3+1}x^{3+1}-\frac{\frac{1}{4}}{4+1}x^{4+1}\right]_{-3}^{3}$$

$$\left(\frac{1}{4}x^4-\frac{\frac{1}{4}}{\frac{5}{1}}x^5\right)_{-3}^{3}$$

$$\left(\frac{1}{4}x^4-\frac{1}{9}x^5\right)_{-3}^{3}$$

$$\left(\frac{1}{4}(3)^4-\frac{1}{9}(3)^5\right)-\left(\frac{1}{4}(-3)^4-\frac{1}{9}(-3)^5\right)$$

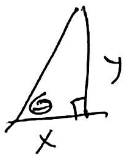
$$\left(\frac{1}{4}(81)-\frac{1}{9}(243)\right)-\left(\frac{1}{4}(81)-\frac{1}{9}(-243)\right)$$

$$\left(\frac{81}{4}-\frac{243}{9}\right)-\left(\frac{81}{4}+\frac{243}{9}\right)$$

$$\frac{81}{4}-\frac{243}{9}-\frac{81}{4}-\frac{243}{9}$$

$$-\frac{486}{9}=-\frac{162}{3}=\underline{\underline{-54}}$$

b. $\int_1^5 \int_0^x \frac{3}{x^2+y^2}\, dy\, dx \longrightarrow \sqrt{x^2+y^2}$



$\sin\theta = \frac{y}{\sqrt{x^2+y^2}}$

$\sqrt{x^2+y^2} = \frac{y}{\sin\theta}$

$x^2+y^2 = \frac{y^2}{\sin^2\theta}$

$$\int_1^5 \int_0^x \frac{3}{\frac{y^2}{\sin^2\theta}}\, dy\, dx$$

$$\int_1^5 \int_0^x \frac{3\sin^2\theta}{y^2}\, dy\, dx$$

$$\int_1^5 \left[3\sin^2\theta \frac{1}{-2+1} y^{-2+1}\right]_0^x dx$$

$$\int_1^5 \left(\frac{3\sin\theta y}{-1} y^{-1}\right)_0^x dx$$

$$\int_1^5 \left(\frac{-3\sin\theta y}{y}\right)_0^x dx$$

$$\int_1^5 \left(\frac{-3\sin\theta x}{x}\right) - \left(\frac{-3\sin\theta(0)}{0}\right) dx$$

$$\int_1^5 -3\sin\theta\, dx$$

$$\left[-3\sin\theta \frac{1}{0+1} x^{0+1}\right]_1^5$$

$$\left[-3\sin\theta \frac{1}{1} x^1\right]_1^5$$

$$\left[-3\sin\theta \cdot x\right]_1^5$$

$$(-3\sin\theta\cdot 5) - (-3\sin\theta\cdot 1)$$

$$(-15\sin\theta) - (-3\sin\theta)$$

$$-15\sin\theta + 3\sin\theta$$

$$-12\sin\theta$$

c. $\int_0^{\frac{\pi}{2}} \int_0^{z} \int_0^{y} \sin(x+y+z)\, dx\, dy\, dz$

$$= \int_0^{\frac{\pi}{2}} \int_0^{z} \left(-\cos(x+y+z)\right)_0^y \, dy\, dz$$

$$= \int_0^{\frac{\pi}{2}} \int_0^{z} \left(-\cos(y+y+z) - (-\cos(0+y+z))\right) dy\, dz$$

$$= \int_0^{\frac{\pi}{2}} \left(\frac{-\sin(2y+z)}{2} + \sin(y+z)\right)_0^z dz$$

$$= \int_0^{\frac{\pi}{2}} \left(\frac{-\sin(2z+z)}{2} + \sin(z+z) - \left(\frac{-\sin(0+z)}{2} + \sin(0+z)\right)\right) dz$$

$$= \int_0^{\frac{\pi}{2}} \left(\frac{-\sin 3z + \sin z}{2} + \sin 2z\right) dz$$

$$= \left(\frac{\cos 3z + (-\cos z)}{6} + \left(\frac{-\cos 2z}{2}\right)\right)_0^{\frac{\pi}{2}}$$

$$= \frac{1}{3}$$

Nama : SUJONO

NIM : 202710020

TUGAS MATAKULIAH MATEMATIKA TERAPAN

NAMA : AKHMAD THARMIZI

NIM : 202710001

MATAKULIAH : MATEMATIKA TERAPAN

PROGRAM MAGISTER TEKNIK SIPIL

FAKULTAS TEKNIK

UNIVERSITAS BINA DARMA

PALEMBANG

2020

1. Selesaikan integral berikut:

a). $\int_{-3}^{3}\int_{0}^{x} (x^2-y^3)\ dy\, dx$

Penyelesaian

$$\int_{-3}^{3}\int_{0}^{x} (x^2-y^3)\, dy\, dx = \int_{-3}^{3} \left[\tfrac{1}{2}x^3 - xy^2\right]_0^x$$

$$= \int_{-3}^{3} \left[\tfrac{1}{2}(x-0) - (x-0)y^3\right] dy$$

$$= \int_{-3}^{3} \left[\tfrac{3}{6}\, y^3\right] dy$$

$$= \int_{-3}^{3} \left[\tfrac{1}{2}\, y^3\right] dy$$

$$= \tfrac{1}{2}\left[(y+3)-(y-3)\right]_{-3}^{3} dy$$

$$= \tfrac{1}{2}\left[(y+3)^3 + (y-3)\right] dy$$

$$= \tfrac{1}{2}\left[(y+9) + (y+9)\right] dy = \tfrac{1}{2}\left[y+18\right]$$

$$= \tfrac{18}{36}\, dy = \tfrac{1}{2}\, dy$$

b) $\int_{1}^{5}\int_{0}^{x} \frac{3}{x^2+y^2}\ dy\, dx$

Penyelesaian:

$$\int_{1}^{5}\int_{1}^{x} 3(x^2+y^2) = \int_{1}^{5}\int_{1}^{x} 3x^2+3y^2$$

$$= \int_{1}^{5}\int_{1}^{x} 6x^2+6y^2 = \int_{1}^{5} \left[6x^2+6y^2\right]_1^x$$

$= \int_1^5 [6(x)^2 + 6(1)^2]$

$= \int_1^5 [6x^2 + 6]$

$= [6x^2 + 6]_1^5 = [6(5)^2 + 6]$

$= [6(25) + 6]$

$= 150 + 6 + c$

$= 156 + c$

c. $\int_0^{\pi/2} \int_0^{z} \int_0^{y} \sin(x+y+z)$ -

Penyelesaian :

$= \int_0^{\pi/2} \int_0^{z} [-\cos(x+y+z)]_0^y \, dy \, dz$

$= \int_0^{\pi/2} \int_0^{z} [\cos(y+z) - \cos(2y+z)] \, dy dz$

$= \int_0^{\pi/2} [\sin(y+z) - ½ \sin(2y+z)]_0^z \, dz$

$= \int_0^{\pi/2} [\sin(2z) - ½ \sin(3z) - \sin(z) + \frac{1}{2} \sin(z)] dz$

$= \int_0^{\pi/2} [\sin(2z) - ½ \sin 3(z) - ½ \sin(z)] dz$

$= [-½ \cos(2z) + \frac{1}{6} \cos 3(z) + ½ \cos(z)]_0^{\pi/2} dz$

$= [-½ \cos(\pi) + \frac{1}{6} \cos(\frac{3\pi}{2}) + ½ \cos(\frac{\pi}{2}) - (-½ \cos(0) + \frac{1}{6} \cos(0)$

$+ \frac{1}{2} \cos(0))]$

$= \frac{1}{2} - (-\frac{1}{2} + \frac{1}{6} + \frac{1}{2})$