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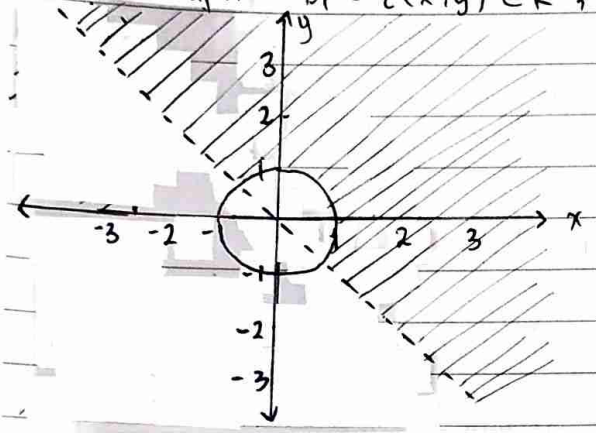
UAS MATEMATIKA II.

1) $f(x,y) = \frac{\sqrt{x^2+y^2-1}}{\sqrt{x+y}}$

- $x^2+y^2-1 \geq 0$

  $x^2+y^2 \geq 1$, $D_F = \{(x,y) \in R^2, x^2+y^2 \geq 1, x < -y\}$
- $x+y > 0$, $D_F = \{(x,y) \in R^2, x^2+y^2 \leq 1, x > -y\}$
- Grafik $D_F = \{(x,y) \in R^2, x^2+y^2 \geq 1, x > -y\}$



2) $f(x,y) = xy + e^y \sin x$

a. $\frac{\partial f(x,y)}{\partial x} = y + e^y \cos x$

b. $\frac{\partial f(x,y)}{\partial y} = x + \sin x \cdot e^y$

3) a. $\int_{-3}^{7}\int_{0}^{2x}\int_{y}^{x-1} 2 \, dz\,dy\,dx = \int_{-3}^{7}\int_{0}^{2x} 2z\Big]_{y}^{x-1} dy\,dx$

$= \int_{-3}^{7} (2x-2)y - 2\cdot\frac{1}{2}y^2\Big]_{0}^{2x} dx$

$= \int_{-3}^{7} (2x-2)(2x) - (2x)^2 \, dx$

$= \int_{-3}^{7} 4x^2 - 4x - 4x^2 \, dx$

$= \int_{-3}^{7} -4x \, dx$

$= -2x^2\Big]_{-3}^{7}$

$= -98 + 18$

$= -80$

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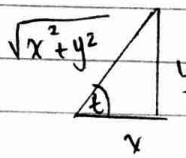
b.) $\int_1^5 \int_0^x \frac{3}{x^2+y^2}\, dy\, dx = \int_1^5 \int_0^x \frac{3 \cdot x \sec^2 t \cdot dt}{x^2 + x^2 \cdot \tan^2 t}\, dx$

$= \int_1^5 \int_0^x \frac{3 \cdot x \sec^2 t \cdot dt}{x^2 (1 + \tan^2 t)}\, dx$

$= \int_1^5 \frac{3}{x} t \Big|_0^x \, dx$



$y = x \tan t$

$dy = x \sec^2 t \, dt$

$\tan t = \frac{y}{x}$

$t = \arctan y/x$

$\int_1^5 \frac{3}{x} \arctan \frac{y}{x} \Big|_0^x \, dx$

$= \int_1^5 \frac{3}{x} (\arctan(1) - \arctan(0))\, dx$

$= \int_1^5 \frac{3}{x} \cdot \frac{\pi}{4} \cdot dx$

$= \frac{3\pi}{4} \int_1^5 \frac{1}{x}\, dx$

$= \frac{3\pi}{4} \left(\ln(x) \Big]_1^5 \right) dx$

$= \frac{3\pi}{4} (\ln(5) - \ln(1))$

$= \frac{3\pi}{4} \ln(5)$..

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4) Volume bola padat $x^2+y^2+z^2 = 9$

$\rho^2 = x^2+y^2+z^2$

$\rho^2 = 9$

$\rho = 3$, batas : $0 \le \rho \le 3$

$\boxed{dV = \rho^2 \sin\phi \, d\rho \, d\theta \, d\phi}$

Jika bola terdapat pada oktan pertama, maka

$0 \le \theta \le \frac{\pi}{2}$ dan $0 \le \phi \le \frac{\pi}{2}$

$$V_{bola} = \int_0^{\pi/2}\int_0^{\pi/2}\int_0^{3} 1 \cdot \rho^2 \sin\phi \, d\rho \, d\theta \, d\phi$$

$$= \int_0^{\pi/2}\int_0^{\pi/2} \frac{1}{3}\rho^3 \sin\phi \Big]_0^3 \, d\theta \, d\phi$$

$$= \int_0^{\pi/2}\int_0^{\pi/2} (9\sin\phi)\, d\theta \, d\phi$$

$$= \int_0^{\pi/2} (9\sin\phi)\theta \Big]_0^{\pi/2} \, d\phi$$

$$= \int_0^{\pi/2} \frac{9}{2}\pi \sin\phi \, d\phi$$

$$= \frac{9}{2}\pi(-\cos\phi)\Big]_0^{\pi/2}$$

$$= -\frac{9}{2}\pi\left(\cos\frac{\pi}{2} - \cos 0\right)$$

$$= -\frac{9}{2}\pi(0-1)$$

$$= \frac{9}{2}\pi$$

Jadi, volume bola padat adalah $\frac{9}{2}\pi$