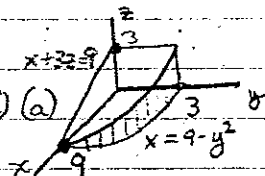


Math 117 Practice Finals

Exam 1

① $\int_{\pi/4}^{\pi/2} \int_0^2 r \cos \theta \, r \, dr \, d\theta$



(b) $\int_0^3 \int_0^{9-3z} \int_0^{\sqrt{9-x}} 1 \, dy \, dx \, dz$

③ (a) $\frac{\partial f}{\partial y} = 6xy^2 = \frac{\partial g}{\partial x}$ (b) $\phi(x, y) = x^2 y^3 + 2x - y^2$ (c) 9 (d) 4/3

⑤ $\int_{-1}^2 \int_{x^2}^{2+x} (3x^2 + 6) \, dy \, dx$ (a) $x = r \cos \theta, y = r \sin \theta, z = 9 - r^2; 0 \leq \theta \leq 2\pi, 0 \leq r \leq 3$

⑥ (b) $\langle 2r^2 \cos \theta, 2r^2 \sin \theta, r \rangle$ (c) outward (d) $\int_0^{2\pi} \int_0^3 2r^3 + r(9-r^2)^2 \, dr \, d\theta$

⑦ $\int_{-2}^2 \int_0^4 \sqrt{4y^2 + 1} \, dx \, dy$ (a) (b) counterclockwise (c) $\langle 0, 0, 1 \rangle$ (positive)

⑨ $\int_0^{2\pi} \int_0^{\pi/6} \int_0^4 [3\rho^2 \sin^2 \phi \cos^2 \theta + (\rho \sin \phi \cos \theta)(\rho \cos \phi)] \rho^2 \sin \phi \, d\rho \, d\phi \, d\theta$

⑩ $\int_0^1 \int_0^{2-2x} -3(3-3x-\frac{3}{2}y) - 3x + 3y^2 - 1 \, dy \, dx$

Exam 2

① $\int_{-2}^4 \int_{1-2x}^{4-x^2} (x-2y) \, dy \, dx$ (a) (b) $\int_{-2}^2 \int_0^{4-x^2} \int_{x^2}^{4-y} 15z^2 \, dz \, dy \, dx$ or $\int_{-2}^2 \int_{x^2}^4 \int_0^{4-z} 15z^2 \, dy \, dz \, dx$

③ (a) Show $\frac{\partial f}{\partial y} = \frac{\partial g}{\partial x}, \frac{\partial f}{\partial z} = \frac{\partial h}{\partial x}, \frac{\partial g}{\partial z} = \frac{\partial h}{\partial y}$ (b) $x^2 \cos y + y^3 z - 2z^3/2$ (c) 4 (d) $-\frac{32}{3}$ using $x = 2 \cos t, y = 2 \sin t, \pi/2 \leq t \leq 3\pi/2$

⑤ $\int_{-\pi/2}^{\pi/2} \int_0^{3 \cos \theta} (2r \cos \theta - 6r^5 \cos^4 \theta \sin \theta + 3) \, r \, dr \, d\theta$ (a) $\vec{F}(r, \theta) = \langle r \cos \theta, r \sin \theta, r^2 \rangle, 2 \leq r \leq 3, 0 \leq \theta \leq \pi/2$

⑥ (b) $\langle -2r^2 \cos \theta, -2r^2 \sin \theta, r \rangle$ (c) upward (d) $\frac{65}{2}$

⑦ Using $\vec{F}(u, v) = \langle u, 5 \cos v, 5 \sin v \rangle \int_0^{\pi/2} \int_0^3 u(5 \sin v) 5 \, du \, dv$
Using $z = (25 - y^2)^{1/2} \int_0^3 \int_0^5 x(25 - y^2)^{1/2} \sqrt{\frac{y^2}{25 - y^2} + 1} \, dy \, dx$

⑧ (a) (b) $\text{curl } \vec{F} \neq \vec{0}$ at the origin. It points in the negative z-direction since the circulation is clockwise

(c) $\text{curl } \vec{F} = \langle 0, 0, -2 \rangle$
⑨ $\int_0^{2\pi} \int_{\pi/3}^{2\pi/3} \int_0^1 (3\rho^2 \sin^2 \phi \cos^2 \theta + \rho^2 \sin \phi \cos \theta \cos \phi) \rho^2 \sin \phi \, d\rho \, d\phi \, d\theta$

⑩ $\iint_R \langle 3z, 5, y^2 \rangle \cdot \langle -\frac{\partial z}{\partial x}, -\frac{\partial z}{\partial y}, 1 \rangle \, dA = \iint_R \langle 3z, 5, y^2 \rangle \cdot \langle 2, 1, 1 \rangle \, dA = \int_0^2 \int_0^{4-2x} 6(4-2x-y) + 5 + y^2 \, dy \, dx$