

Problem 1

$$\int_0^{\frac{\pi}{2}} \int_0^1 r^2 r dz dr d\theta \quad \checkmark$$

Problem 2

a) $\rho = 2a \cos \phi \quad \checkmark$

b) $\rho = a \sec \phi \quad \checkmark$

c) $\int_0^{2\pi} \int_0^{\frac{\pi}{4}} \int_{a \sec \phi}^{2a \cos \phi} \rho^2 \sin \phi d\rho d\phi d\theta \quad \checkmark$

Problem 3

a) $M_y = N_x = 2n$

$$M_z = P_x = 3n z^2$$

$$N_z = P_y = 2y \quad \checkmark \quad \checkmark$$

b) $f_{yy} = 2ny + z^3 \Rightarrow f = n^2 y + nz^3 + g(y, z) \quad \checkmark$

$$\Rightarrow f_y = n^2 + g_y(y, z) = n^2 + 2yz \Rightarrow g_y = 2yz$$

$$\Rightarrow g = y^2 z + h(z) \Rightarrow f = n^2 y + nz^3 + y^2 z + h(z)$$

$$\Rightarrow f_z = 3nz^2 + y^2 + h'(z) = y^2 + 3nz^2 - 1$$

$$\Rightarrow h'(z) = -1 \Rightarrow h = -z \Rightarrow f = n^2 y + nz^3 + y^2 z - z$$

 $-z$

Problem 4

$$\text{a) } \iint_S \langle u, y, 2(1-z) \rangle \cdot \langle 2u, 2y, 1 \rangle dA = 2\pi \checkmark$$

$$\text{b) } \iint_T \langle u, y, 2 \rangle \cdot (-k) ds = -2\pi \checkmark$$

Problem 5

$$\text{a) } \operatorname{curl} F = 2y i - 2u j \checkmark$$

$$\text{b) } \operatorname{curl} F = 0 \checkmark$$

$$\text{c) } \iint_R \operatorname{curl} F = 0 \checkmark$$