

Name:

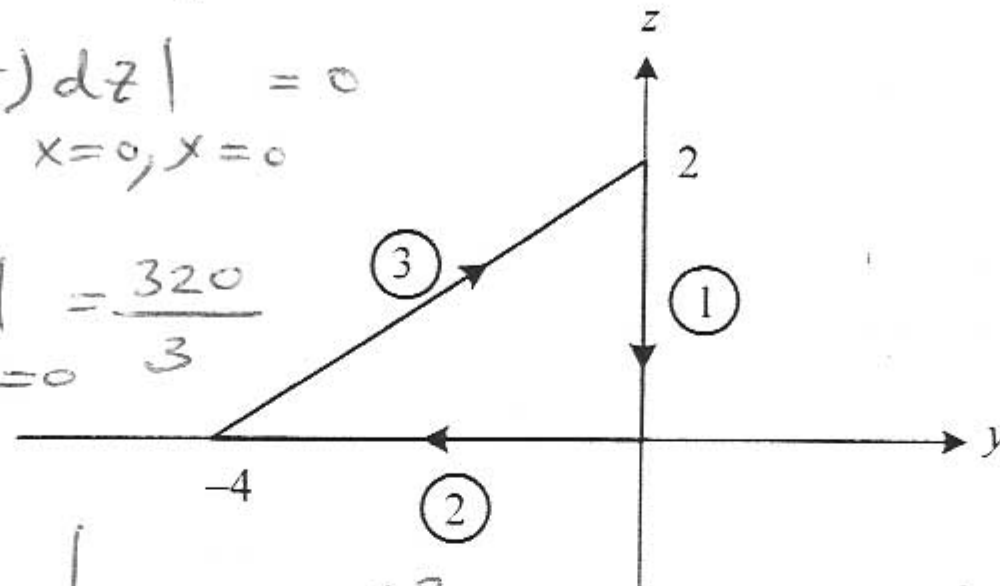
I.D. Number:

KEY

Given the vector field $\vec{A} = 2yz^2 \vec{a}_x - (5+7z)y^2 \vec{a}_y + (3x^2 - 2y^2) \vec{a}_z$, evaluate the line integral $\oint \vec{A} \cdot d\vec{l}$ over the closed path shown in the figure.

$$I_1 = \int_{z=2}^0 (3x^2 - 2y^2) dz \Big|_{x=0, y=0} = 0$$

$$I_2 = \int_{y=0}^{-4} -(5+7z)y^2 dy \Big|_{z=0} = \frac{320}{3}$$



$$I_3 = \int_{y=-4}^0 -(5+7z)y^2 dy \Big|_{z=0.5y+2} + \int_{z=0}^2 (3x^2 - 2y^2) dz \Big|_{x=0, y=2z-4}$$

$$= \int_{y=-4}^0 -(5+3.5y+14)y^2 dy + \int_{z=0}^2 -2(2z-4)^2 dz$$

$$= - \int_{-4}^0 (19y^2 + 3.5y^3) dy - \int_{z=0}^2 (8z^2 - 32z + 32) dz$$

$$= - \left[19 \frac{y^3}{3} + \frac{3.5y^4}{4} \right]_{-4}^0 - \left[\frac{8z^3}{3} - \frac{32z^2}{2} + 32z \right]_0^2$$

$$I = I_1 + I_2 + I_3$$