

Q-1) Show that the vector field

$$\mathbf{F} = (-\tan(x + y^2 + z^3), -2y \tan(x + y^2 + z^3), -3z^2 \tan(x + y^2 + z^3))$$

is conservative. Find a potential function for \mathbf{F} and evaluate the integral

$$\int_{(0,0,0)}^{(1,2,3)} \mathbf{F} \cdot \mathbf{T} d\sigma.$$

Solution: A potential function for this field is $f = \ln \cos(x + y^2 + z^3) + C$. The integral then has the values $f(1, 2, 3) - f(0, 0, 0) = \ln \cos 32 \approx -0.181$.