Taker Name: Key GTID: 90 Section:

Grader #1: GTID: 90

§16.3: FToLI and Potential Functions

Find a potential function for $\mathbf{F} = \langle P, Q, R\rangle$ and use FToLI to evaluate the line integral over the curve C parametrized by $\mathbf{r}(t)$, $t \in [0,1]$.

$$\int_C \mathbf{F}\cdot T\,ds = \int_C (2x\ln y - yz)\,dx + \left(\frac{x^2}{y} - xz\right)\,dy - xy\,dz,$$

where $\mathbf{r}(0) = (1,2,1)$, $\mathbf{r}(1) = (2,1,1)$.

$F = \langle 2x\ln y - yz,\ \frac{x^2}{y} - xz,\ -xy\rangle = \langle P, Q, R\rangle$

$f_x = P \Rightarrow f = \int 2x\ln y - yz\,dx = x^2\ln y - xyz + C(y,z)$

and $f_y = Q \Rightarrow \frac{x^2}{y} - xz + C_y(y,z) = \frac{x^2}{y} - xz \Rightarrow C(y,z) = C(z)$

Then $f_z = R \Rightarrow 0 - xy + C'(z) = -xy \Rightarrow C(z) = C.$

So $f = x^2\ln y - xyz + C$ (Set $C = 0$)

Then $\int_{(1,2,1)}^{(2,1,1)} F\cdot dr = f(1,2,1) - f(2,1,1)$

$= [1\ln 2 - 1*2*1] - [2\ln 1 - 2*1*1]$ ($\ln 1 \to 0$)

$= \ln 2 - 2 + 2$

$= \boxed{\ln 2}$

A	
J	
N	

G2:

A	
J	
N	

G3:

A	
J	
N	