

Math2E - Practice Midterm2

1. $\mathbf{F} = (z^2 + 2xy)\mathbf{i} + x^2\mathbf{j} + 2xz\mathbf{k}$. (a): Determine whether the vector field is conservative;
(b): Evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$, where C runs from $(2, 3, 1)$ to $(4, -1, 0)$.

2. Evaluate $\int_C (y + e^{\sqrt{x}})dx + (2x + \cos y^2)dy$, where C is the boundary of the region enclosed by the parabolas $y = x^2$ and $x = y^2$, and C is positively oriented.

3. Evaluate $\iint_S (x - z) dS$, where S is the portion of the cylinder $x^2 + z^2 = 1$ above the xy -plane between $y = 1$ and $y = 2$.

4. Evaluate the flux integral $\int \int_S \mathbf{F} \cdot \mathbf{n} dS$, where $\mathbf{F} = \langle y, -x, z \rangle$, S is the portion of $z = \sqrt{x^2 + y^2}$ below $z = 4$. (\mathbf{n} downward).

5. Evaluate $\iint_S \mathbf{F} \cdot \mathbf{n} dS$, where $\mathbf{F}(x, y, z) = 4x\mathbf{i} + (x^2 - 2y)\mathbf{j} + (3z + x^2)\mathbf{k}$ and S is the boundary of $z = x^2 + y^2$ and $z = 2 - x^2 - y^2$ with outward orientation.