

Vv285 Final Review Recitation Class

Manage Your Integral

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Outline

- 1 Orientation Matters!
- 2 Choose the Right Theorem!
- 3 Beyond Integrals, Look up to Concepts!
- 4 Reference

Managing Orientation of Curves

TASK

Evaluate $\int_{C^*} F \vec{dl}$, where $F(x, y) = (7x + y^2, -x^2 + 2y)^T$. Where C^* is shown in fig(1).

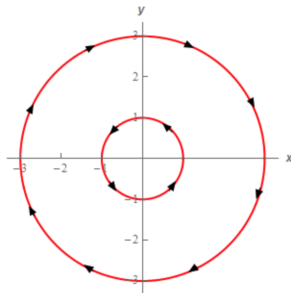


Figure: 1

Managing Orientation of Surfaces

TASK

Calculate the circulation of field $F(x, y, z) = (z, x, y)^T$ along the circle in \mathbb{R}^3 defined by $C = \{(x, y, z) \in \mathbb{R}^3 : x^2 + y^2 + z^2 = 1, y + z = 1\}$.

Don't Calculate, Find the Easiest Way

TASK

Evaluate $\int_{C^*} (6x - 5y^2 + 2xy^3 - 10)dx + (3x^2y^2 - 10xy)dy$ where C^* is shown in fig(2).

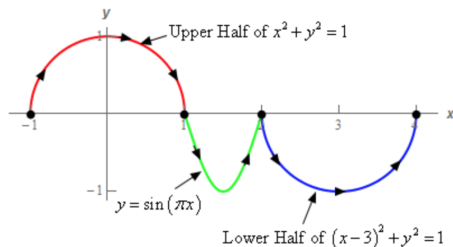


Figure: 2

Don't Calculate, Find the Easiest Way

TASK

Evaluate $\int_{C^*} F \cdot d\vec{l}$ where $F(x, y, z) = (zx^3 - 2z, xz, yx)$ and C^* is a three dimensional curve shown in fig(3), with vertices $(2, 0, 0)$, $(0, 2, 0)$, $(0, 0, 4)$.

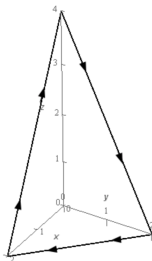


Figure: 3

Don't Calculate, Find the Easiest Way

TASK

Evaluate $\iint_{S^*} \mathbf{F} \cdot d\vec{S}$ where $\mathbf{F}(x, y, z) = (4x - z^2, x + 3z, 6 - z)$ and S is the surface of the solid bounded by the cylinder $x^2 + y^2 = 36$ and planes $z = -2$ and $z = 3$.

Warm Reminders - Concepts, Concepts, Concepts!

- Look up Laplacian which is related to fluid dynamics. This is a major application of vector calculus.
- Review concepts of gradient and first derivative, relate to the second derivative. You should know how to calculate **directional derivative** as well as **normal derivative**.
- Review chapter two: property of continuous function from \mathbb{R}^m to \mathbb{R}^n . Enhance your skill on line integral, surface integral, double integral and triple integral.
- Parametrization is important! Give a review on change of variables (a det of Jacobian will be inserted to the integral).
- At last, it's lucky to be your TA. Though it's a bit unlucky that I can't meet you in person, but thank you for your company!
Gook luck and brace yourself for challenges!

References I

- VV285 slides from Horst Hohberger
- VV285 Sample exam 3 from Horst Hohberger
- Paul's online note
<https://tutorial.math.lamar.edu/>