MA153 Lesson 45

LESSON 45 - Surface Integrals

14 November, 2008

Outline

Admin

1. This Week - Surface Integrals.

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2. Next Week - Project Drop on Monday, Stoke's Theorem on Tuesday and Wednesday, Divergence Theorem on Wednesday and Thursday, Guest Lecture on Friday: Dr. Ben Cole - Thayer 144 - Dean's Hour!

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4. Homework 8 due next Friday, 21 November!

Block IV - Chapter 16

1. Vector Fields - 16.1: Functions that assign vectors to points in space.
2. Line Integrals - 16.2: Integrating over a curve.
3. Fundamental Theorem for Line Integrals - 16.3: Using FTC for line integrals.
4. Green's Theorem - 16.4:
5. Curl and Divergence - 16.5:
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9. Divergence Theorem - 16.9:

Parametric Surface

1. $$\vec{r}(u,v) = x(u,v)\hat{i} + y(u,v)\hat{j} + z(u,v)\hat{k}$$

Tangent Planes

1. $$\vec{r}_v = \frac{\partial x}{\partial v}(u_0, v_0)\hat{i} + \frac{\partial y}{\partial v}(u_0, v_0)\hat{j} + \frac{\partial z}{\partial v}(u_0, v_0)\hat{k}$$
$$\vec{r}_u = \frac{\partial x}{\partial u}(u_0, v_0)\hat{i} + \frac{\partial y}{\partial u}(u_0, v_0)\hat{j} + \frac{\partial z}{\partial u}(u_0, v_0)\hat{k}$$

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2. $$\vec{n} = \vec{r}_u \times \vec{r}_v$$

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2. $$\vec{n} = \vec{r}_u \times \vec{r}_v$$
3. $$\vec{n} \cdot (\vec{r} - \vec{r}_0) = 0$$

Surface Area

1. $$A(S) = \iint_D |\vec{r}_u \times \vec{r}_v| dA$$

Surface Area

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2. $$A(S) = \iint_D \sqrt{1 + \left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2} dA$$

Homework Help

Outline

Course Guide

Surface Integrals - 16.7

1. Develop an understanding of the surface integral of a scalar functions viewed as and extension of the surface area integral.
2. Develop an understanding of oriented surfaces and positive orientation.
3. Determine the surface integral over a surface.
4. Develop an understanding of flux (surface integrals of vector fields).
5. Use surface integrals to determine the electric flux, net charge, and heat flow across a solid region.
6. HOMEWORK PROBLEMS: 2, 10, 25

Outline

1. We are going to look in the book

Board Work

1. A few problems to get you warmed up!

Outline

Homework Help

Look Forward

Stokes' Theorem - 16.8

1. Understand how Stokes' Theorem relates surface integrals to line integrals around a boundary curve.
2. Be able to apply Stokes' Theorem.
3. HOMEWORK PROBLEMS: 3, 8

Questions?

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