MA153 Lesson 28

LESSON 28 - Iterated Integrals Over General Regions

15 RockTober, 2008

Outline

1. Admin
2. Last Class
   - Iterated Integrals Step by Step
   - Homework Help
3. Iterated Integrals Over General Regions
   - Course Guide
   - Step by Step
   - Homework Help
   - Word Problems with Iterated Integrals
4. Look Forward

Admin

1. Project Turn In

Admin

2. This week - Integrals
   Next Week - Guest Lecture on Monday, Triple Integrals Tuesday, Wednesday, and Thursday - Review on Friday!

Admin

3. WPR III on Monday, 27 October, in class

Admin

4. Quiz This Friday in Class! Will cover something similar to question 4b on WPR II and an iterated integral!

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Iterated Integrals Step by Step

1. Create a 3D plot of the surface over the region

Iterated Integrals Step by Step

1. Create a 3D plot of the surface over the region
2. Draw and label the region

Iterated Integrals Step by Step

1. Create a 3D plot of the surface over the region
2. Draw and label the region
3. Choose the order of integration

Iterated Integrals Step by Step

1. Create a 3D plot of the surface over the region
2. Draw and label the region
3. Choose the order of integration
4. Compute/Evaluate the "inside" integral

Iterated Integrals Step by Step

1. Create a 3D plot of the surface over the region
2. Draw and label the region
3. Choose the order of integration
4. Compute/Evaluate the "inside" integral
5. Compute/Evaluate the "outside" integral

Iterated Integrals Step by Step

1. Create a 3D plot of the surface over the region
2. Draw and label the region
3. Choose the order of integration
4. Compute/Evaluate the "inside" integral
5. Compute/Evaluate the "outside" integral
6. Does the answer make sense?

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Homework Help

Questions

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Objectives

Double Integrals over General Regions - 15.3

1. Be able to set up the limits of double integrals and change the order of integration.
2. Use double integrals to determine the volume of a region bounded by multiple surfaces.
3. Use double integrals to determine the area of a planar region bounded by multiple curves.
4. Use double integrals to determine the density, mass, and center of mass of a lamina of variable density.
5. HOMEWORK PROBLEMS: 5, 10, 22, 43, 45

Integrating over General Regions

- Integrating over General Regions.
- Evaluate $\iint\limits_D (x+2y)dA$, where D is the region bounded by the parabolas $y = 2x^2$ and $y = 1 + x^2$. Start by plotting it and evaluating it in Mathematica, then do it by hand.

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Step by Step

1. Sketch the region

Step by Step

1. Sketch the region
2. Label the boundaries

Step by Step

1. Sketch the region
2. Label the boundaries
3. Solve for and label the intersections

Step by Step

1. Sketch the region
2. Label the boundaries
3. Solve for and label the intersections
4. Compute/Evaluate the "inside" integral

Step by Step

1. Sketch the region
2. Label the boundaries
3. Solve for and label the intersections
4. Compute/Evaluate the "inside" integral
5. Compute/Evaluate the "outside" integral

Step by Step

1. Sketch the region
2. Label the boundaries
3. Solve for and label the intersections
4. Compute/Evaluate the "inside" integral
5. Compute/Evaluate the "outside" integral
6. If possible, check answer in Mathematica

Board Problems

1. Calculate the volume of the space between the surface $f(x, y) = xy$, and the region bounded by $y = 4 - x^2$ and $y = 4 - x$.
2. Evaluate the integral: $\int_0^4 \int_{\frac{1}{2}y}^{\sqrt{y}} xy \, dxdy$
3. Calculate volume of the space between the surface $f(x, y) = x - y$ and the region bounded by $x = y, x = \frac{1}{2}y$, and $x = 2$.

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Homework Help

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Word Problems with Iterated Integrals

1. A culture of brewers yeast is located precisely in the middle of a square fermenting vessel with each side of length 4 feet. If the yeast culture is placed at the point (0,0), and yeast multiplies and disperses in such a matter that the concentration at any point (x,y) in the vessel is given by $C(x, y) = 1000(24 - 3x^2 - 3y^2)$, where $C(x, y)$ is the number of yeast cells per square foot of surface per day at a point (x, y) in the vessel, then what is the average concentration of yeast in the beer each day.

Look Forward

Double Integrals in Polar Coordinates - 15.4

1. Understand the definition of a polar rectangle, what is looks like, and its differential area $(rdrd\theta)$.
2. Convert from rectangular to polar coordinates in a double integral.
3. Understand that some double integrals are simpler to compute in polar coordinates.
4. HOMEWORK PROBLEMS: 2, 11, 22, 30

Questions?

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