MA153 Lesson 27

LESSON 27 - Iterated Integrals

9 October, 2008

Outline

1. Admin
2. Last Class
   - Double Riemann Sums and Double Integrals
   - Homework Help
3. Iterated Integrals
   - Course Guide
   - Iterated Integrals Step by Step
   - Fubini's Theorem
   - Some Board Problems
   - Homework Help
4. Look Forward

Admin

1. Project Questions?

Admin

2. This week - Integrals Today
   Next Week - IT Lab Monday and Tuesday, Integrals Wednesday - Friday

Admin

3. **Project Due Wednesday, 15 October, In Class**

Admin

3. **Project Due Wednesday, 15 October, In Class**
4. **SAY IT WITH ME - Project Due Wednesday, 15 October, In Class**

Admin

5. For varying gravity I only want 2 other points. Specifically the day before and after where we get gravity as (1,2,9.8) and (3,0,9.8)

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Double Riemann Sums and Double Integrals

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5. Next we set up Riemann Sums $V = \lim_{m,n\to\infty} \sum_{i=1}^{m} \sum_{j=1}^{n} f(x_{ij}^*, y_{ij}^*)\Delta A$
6. Finally we get the double integral
$$\int\int_R f(x,y)dA = \lim_{m,n\to\infty} \sum_{i=1}^{m} \sum_{j=1}^{n} f(x_{ij}^*, y_{ij}^*)\Delta A$$

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Homework Help

Questions

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Objectives

Iterated Integrals - 15.2

1. Understand Fubini's Theorem and how it makes computations easier.
2. Understand the geometric interpretation of Fubini's Theorem or slicing the area in two different ways.
3. Understand the difference between an iterated integral and a double integral.
4. HOMEWORK PROBLEMS: 1, 6, 17, 23, 26

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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

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4. Compute/Evaluate the "inside" integral

Iterated Integrals Step by Step

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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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Fubini's Theorem and Switching the Order of Integration

- $$\iint_R f(x,y)dA = \int_a^b \int_c^d f(x,y)dydx = \int_c^d \int_a^b f(x,y)dxdy$$

Fubini's Theorem and Switching the Order of Integration

- $\iint\limits_R f(x,y)dA = \int_a^b \int_c^d f(x,y)dydx = \int_c^d \int_a^b f(x,y)dxdy$
- A visual

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Some Board Problems

1. $\displaystyle\int_0^4 \frac{y}{x+2}\,dy$
2. $\displaystyle\int_2^4 \int_{-1}^1 (x^2+y^2)\,dy\,dx$
3. $\displaystyle\int_{-1}^1 \int_2^4 (x^2+y^2)\,dx\,dy$
4. $\displaystyle\int_0^1 \int_1^2 \frac{xe^x}{y}\,dx\,dy$
5. $\displaystyle\int_0^2 \int_0^{\pi/2} x\sin y\,dy\,dx$

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Homework Help

Look Forward

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

Questions?

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