MA205 Lesson 23

Lesson 24 - Iterated Integrals Over Rectangular Regions II

Friday, September 29, 2007

Outline

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Iterated Integrals Step by Step With a Physical Example

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

Iterated Integrals Step by Step With a Physical Example

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

Iterated Integrals Step by Step With a Physical Example

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 With a Physical Example

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 With a Physical Example

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 With a Physical Example

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?

Outline

1. Questions From Lesson 23, Iterated Integrals I
   - Iterated Integrals Step by Step
   - Fubini's Theorem
   - Some Board Problems

2. Iterated Integrals II
   - Word Problems with Iterated Integrals

3. Lesson Link

Fubini's Theorem and Switching the Order of Integration

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

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Some Board Problems

1. $$\int_0^4 \frac{y}{x+2} dy$$
2. $$\int_2^4 \int_{-1}^1 (x^2 + y^2) dydx$$
3. $$\int_{-1}^1 \int_2^4 (x^2 + y^2) dxdy$$
4. $\displaystyle\int_0^1 \int_1^2 \frac{xe^x}{y} dydx$ find the antiderivative of xe^x using Mathematica
5. $$\int_0^2 \int_0^{\pi/2} x \sin y \ dydx$$
6. $$\int_0^1 \int_0^1 \frac{xy}{\sqrt{x^2 + y^2 + 1}} dydx$$

Outline

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.

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.

Questions