Math 233 - December 3, 2009

- Spherical transformation of integrals

1. Compute

$$\int_a^{\rho} \pi(\rho^2 - z^2)\, dz =$$

2. Let $f(t)$ be a function on the inteval $[a, b]$. What does the Mean Value Theorem say about f?

3. Let $f(\rho) = \frac{1}{3}\rho^3$ on the interval $[\rho_1, \rho_2]$. What does the mean value theorem say about this f?

4. Let $f(\phi) = \cos\phi$ on the interval $[\phi_1, \phi_2]$. What does the mean value theorem say about this f?

Lecture Problems

5.

$$\int_0^3 \int_0^{\sqrt{9-y^2}} \int_{x^2+y^2}^{\sqrt{18-x^2-y^2}} (x^2 + y^2 + z^2)\, dz\, dx\, dy =$$

6. Let R be the region bounded by $x^2+y^2 = z^2$ and $x^2+y^2 = 4y$. Set up the integral using spherical coordinates.

$$\iiint_R \frac{1}{x^2 + y^2 + z^2}\, dV =$$