Math 209

Assignment 3

Due: 12:00 Noon on Thursday, October 6, 2005.

---

1. Find the minimum of the function $f(x, y, z) = x^2 + y^2 + z^2$ subject to the condition $x + 2y + 3z = 4$.

2. Find the maximum value of the function $F(x, y, z) = (x+y+z)^2$, subject to the constraint given by $x^2 + 2y^2 + 3z^2 = 1$.

3. Find the maximum and minimum values of the function
$$f(x, y, z) = 3x - y - 3z,$$
subject to the constraints
$$x + y - z = 0, \qquad x^2 + 2z^2 = 1.$$

4. Find the extreme values of the function $f(x, y, x) = xy + z^2$ on the region described by the inequality $x^2 + y^2 + z^2 \leq 1$. Use Lagrange multipliers to treat the boundary case.

5. Use Lagrange multipliers to prove that a rectangle with maximum area, that has a given perimeter p, is a square.

6. Evaluate
$$\int_0^2 \frac{x}{y^2 + 1} dy.$$

7. Calculate the iterated integral
$$\int_1^2 \int_0^1 (x + y)^{-2} dx dy.$$

8. Calculate the double integral
$$\iint_R x \sin(x + y) \, dA, \qquad \text{where} \qquad R = [0, \pi/6] \times [0, \pi/3].$$

9. Calculate the double integral
$$\iint_R \frac{x}{x^2 + y^2} \, dA, \qquad \text{where} \qquad R = [1, 2] \times [0, 1].$$

10. Find the volume of the solid that lies under the hyperbolic paraboloid $z = y^2 - x^2$, and above the square $R = [-1, 1] \times [1, 3]$.