

Study guide for Math 302 Midterm 1

Monday, September 24

These are the sorts of questions you should know how to solve for the first midterm.

1. Know how to state all the versions of Fubini's theorem we have used. Pay special note to the assumptions needed about the function $f(x, y)$!
2. Consider the planes given by $x + y - 2z = 4$ and $2x + 3z = 1$. Find an equation for the line which is their intersection.
3. Consider the three points $(1, 2, 3)$, $(-1, 2, -3)$ and $(1, -1, -1)$. Find an equation for the plane spanned by them.
4. Calculate the double integral $\iint_R e^x \sin y + e^y \cos x \, dA$ over the rectangular region R given by $0 \leq x \leq \pi$ and $0 \leq y \leq \pi/2$.
5. What is the volume between the paraboloid $z = x^2 + y^2$ and the plane $z = 9$?
6. Calculate the double integral $\iint_R ye^{x+y} \, dA$ over the triangular region R bounded by the lines $y = 2x$, $x = 0$, and $y = 2$.
7. What is the average value of the function $f(x, y) = 2x^2 + 2y^2 - \sqrt{x^2 + y^2}$ over the circular region of radius 3 centered at the origin?
8. Set up but do not solve four different iterated integrals which are equal to the double integral

$$\iint_R xy + e^{x^2+y^2} \, dA$$

where R is the upper half circle of radius π centered at the origin. (Hint: you can get two in rectangular coordinates, and two in polar coordinates.)

9. Sketch the region R bounded by the curves $y = x^2$ and $x = y^2$. What is the average value of the function $f(x, y) = x + y$ over this region R ?