

Midterm 2; Math 225 A1
November 18, 2002

This exam is a closed book, no notes, no “crib sheets” exam. Calculators are permitted. There are 6 problems on this exam – don’t overlook those on the back of the page. The number of points that each problem is worth is printed next to the problem. Good luck!

1. Compute the directional derivative of the function $f(x, y) = x/y$ at the point $(6, -2)$ in the direction of the vector $\underline{\mathbf{v}} = \langle -1, 3 \rangle$. (16 pts.)
2. Evaluate the double integral $\int \int_D xy dA$, where D is the region in the xy -plane bounded by the curves $8y = x^2$ and $x = y^2$. (17 pts.)
3. Suppose that the values of the function $f(x, y)$ are given in the table below. Use the midpoint rule with $m = n = 3$ to estimate the value of

$$\int \int_S f(x, y) dA ,$$

where S is the square with corners at $(0, 0)$, $(0, 3)$, $(3, 0)$, and $(3, 3)$. (17 pts.)

Don’t forget the problems on the back!

4. Write as an iterated integral the volume of the wedge cut from the cylinder $x^2 + y^2 = 1$ by the planes $z = 0$ and $z - y = 0$. Be careful to specify the limits on the integrals, and the order of integration, but **you do not have to evaluate these integrals.** (17 pts.)

5. Find the dimensions of the rectangular box (with a lid) of largest volume if the total surface area is given as 64 cm^2 . (17 pts.)

6. A contour map of a function f is shown below. Explain which of the following vectors is most likely to represent the gradient $\nabla f(0.5, 0.5)$.

- $\langle 1, -0.5 \rangle$
- $\langle 1, 1.5 \rangle$
- $\langle -1, 1 \rangle$
- $\langle -1, 0.5 \rangle$

You must explain your answer correctly – no credit will be given if you just write one of these answers. (16 pts.)