Math 303, Exam #3 **Name:** ______________________________
Fall 2002

Please write out the full pledge, and sign below.

1. Use the following table of values to find a lower estimate of $\int_R f(x,y)\,dA$, where R is the rectangle $0 \le x \le 1$, $-1 \le y \le 0$.

		x			
		0	.5	1	1.5
	-1	1	5	7	10
y	-.5	2	4	8	11
	0	3	5	9	13
	.5	4	6	11	15

Compute each of the following integrals.

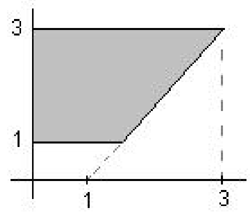
2. $\int_0^1 \int_{-1}^1 (2x^2 + y^2)\,dx\,dy$

3. $\int_0^1 \int_y^{\sqrt{y}} (2xy - y^2)\,dx\,dy$

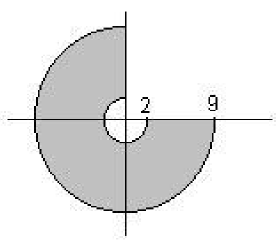
4. Sketch the region of integration for the integrals in each of the last two problems.

5. For each of the regions, write the integral of $f(x, y) = x^2 - y^2$ over the region as an iterated integral. State which coordinate system you are using.

a.

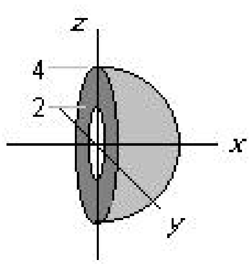


b.



6. For each of the following regions, set up a triple integral of $f(x, y, z) = xy + z$ over the region.

a.



b. The cylinder of radius 2 and height 4, centered at the origin.

7. Parametrize the line from the point (2,4,-1) to the point (0,1,2).

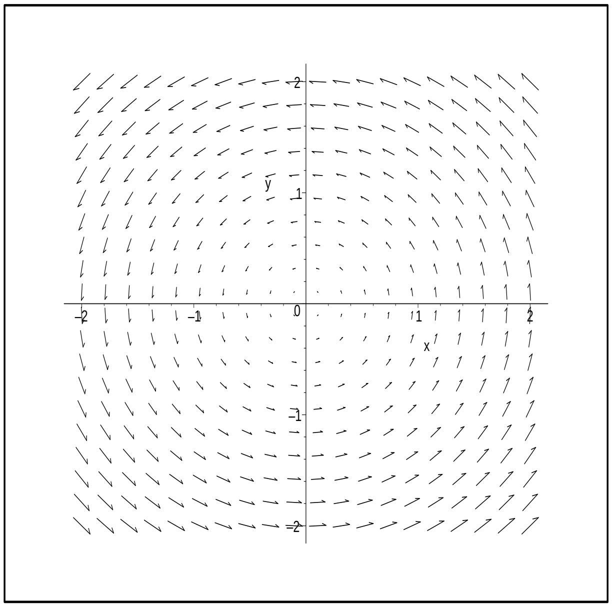
8. Find a and b so that the following lines intersect.

$$\begin{aligned} \vec{r}_1(t) &= (t-1)\vec{\imath} + (2t+1)\vec{\jmath} + (3-t)\vec{k} \\ \vec{r}_2(t) &= (t+2)\vec{\imath} + (1-t)\vec{\jmath} + (at+b)\vec{k} \end{aligned}$$

9. Sketch the vector field $\vec{F} = y\vec{\imath}$

10. Parametrize the plane through the point $(1,-1,2)$ that contains the vectors $2\vec{\imath} - \vec{\jmath} + \vec{k}$ and $\vec{\imath} + 3\vec{\jmath} - \vec{k}$

11. The vector field $\vec{F}(x,y) = -y\vec{\imath} + x\vec{\jmath}$ is drawn below.



a. determine which of the following parametrized curves could be flow lines for this vector field.

(**i**) $\vec{r}_1(t) = 2\cos(t)\vec{\imath} - 2\sin(t)\vec{\jmath}$

(**ii**) $\vec{r}_2(t) = 2\cos(t)\vec{\imath} + 2\sin(t)\vec{\jmath}$

(**iii**) $\vec{r}_3(t) = -2\cos(t)\vec{\imath} + \sin(t)\vec{\jmath}$

(**iv**) $\vec{r}_4(t) = \cos(t)\vec{\imath} - \sin(t)\vec{\jmath}$

(**v**) $\vec{r}_5(t) = \sin(t)\vec{\imath} - \cos(t)\vec{\jmath}$

b. Write down the differential equations associated to the vector field. For each of the the curves that could be flow lines, show that the curve satisfies the differential equations.