Practice Mini-Test 5 – Calculus 3 – Spring 04

1. T2#8 F03 Rect/Cyl/Sphere [Compare T2#7 S03 T3#8 F02 T3#8 F00 T3#3 S00] Sketch the region and rewrite the cylinderical triple integral below in both spherical and rectangular coordinates, do NOT evaluate. (Here $\delta = \delta(x,y,z) = \delta(z,r,\theta) = \delta(\rho,\phi,\theta)$ is some density funtion.)

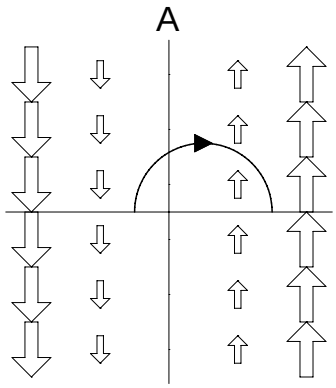
$$\int_0^{\pi/2} \int_0^2 \int_{-\sqrt{4-r^2}}^0 \delta\, r\, dz\, dr\, d\theta$$

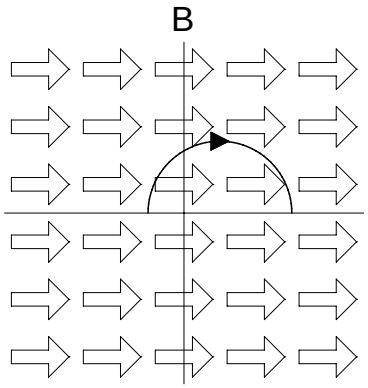
2. T2#9 F03 Polar [Compare T3#3 F00] Sketch the region of integration of the polar coordinate integral

$$\int_0^{\pi/2} \int_0^2 r^2 \cos\theta\, dr\, d\theta$$

and rewrite it as a rectangular integral (or sum of integrals) in BOTH orders $dx\,dy$ and $dy\,dx$ and evaluate all the integrals on your TI-89.

3. T3#4 F03 Vector fields [Compare T3#6 F02 T3#7 S02 T3#6 F00] Find formulas for the two vector fields below. (There are many possible answers.) Decide if the line integrals over the given curves will be positive negative or zero in each plot.

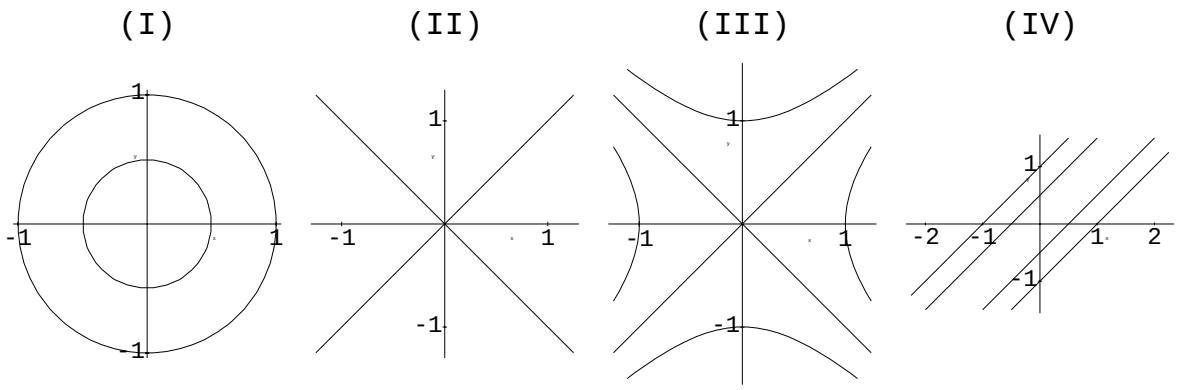




4. T3#3 S03 Volume. Write down a triple integral which will give the volume of the region under the surface $z = 1 + x + y^2$ above the triangle $T = \{(x,y) : 0 \le y \le 1, 0 \le x \le y\}$ in the xy-plane. Do NOT evaluate.

5. T3#4 S02 Mass. Write down triple integrals in each of the coordinate systems spherical, cylinderical and rectangular which will compute the mass of the hemisphere region given by $x^2 + y^2 + z^2 \le R^2$ and $z \ge 0$ with density function δ. Do NOT evaluate.

6. T3#6 S00 Flows Match the following vector fields with their flow lines. (a)$\langle y, x\rangle$ (b)$\langle -y, x\rangle$ (c)$\langle x, y\rangle$ (d)$\langle x - y, x - y\rangle$.



7. F #9 F03 Euler. Consider the vector field $\vec{F} = \langle -y - x/10, x - y/10 \rangle$

   (a) Show $\vec{r}(t) = \left\langle e^{-t/10}\cos t, e^{-t/10}\sin t \right\rangle$ is a flow for $\vec{F}$

   (b) Use Euler's method to approximate the flow which starts at $(1, 0)$ by completing a table that starts like the one below with as much accuracy has your TI-89 can give. [Check to see that you are in both radian mode and using the Euler method]. Do five steps of size $\Delta t = 0.1$

t	x	y
0.0	1	0
0.1	?	?

8. T3#10 F98 Match the parameteric equations $\vec{r}(s,t) = \langle \cos t, \sin t, s \rangle$, $\vec{r}(s,t) = \langle s\cos t, s\sin t, s \rangle$, $\vec{r}(s,t) = \langle (2+s)\cos 2t, (2+s)\sin 2t, t \rangle$ and $\vec{r}(s,t) = \langle \sin s \cos t, \sin s \sin t, \cos s \rangle$ with the Maple plot3d's below. The range is always $s = 0..2, t = 0..4$.