MAC 2313 Calculus 3 **Test 2** 9 Feb 2005

Directions: Show **ALL** work for credit; Give **EXACT** answers when possible; Start each problem on a **SEPARATE** page; Use only **ONE** side of each page; Be neat; Leave margins on the left and top for the **STAPLE**; Calculators can be used for graphing and calculating only; Nothing written on this page will be graded;

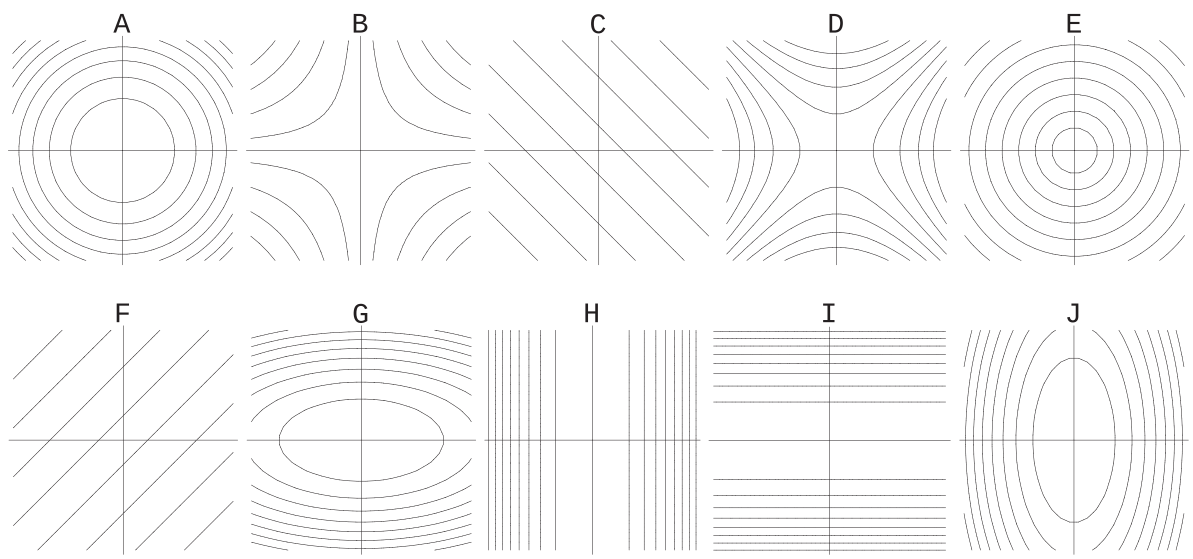
1. Find the equation of the tangent plane to $f(x,y) = xy^2e^{x-y}$ when $(x,y) = (-2,-3)$.

2. Use spherical coordinates to find

$$\lim_{(x,y,z)\to(0,0,0)} \frac{\sin(x^2+y^2+z^2)}{x^2+y^2+z^2}$$

3. A particle starts at the origin with an initial velocity of $\langle 1,-1,3\rangle$. Its acceleration is $\vec{a}(t) = \big\langle 6t, 12t^2, -6t\big\rangle$.
   (a) Find its position function $\vec{r}(t)$.
   (b) Find and simplify the tangential and normal components of the acceleration, $\vec{a}(t)$, at time $t = 1$.

4. The following are contour plots of $z = xy$,$z = x^2+y^2$,$z^2 = x^2+y^2$, $z = x^2+4y^2$,$z = 4x^2+y^2$,$z = x^2$,$z = y^2$ $z = x+y$,$z = x-y$ and $z = x^2-y^2$. Match the plot to the function.



5. For the curve $\vec{r}(t) = \big\langle \sin(t), \cos(t), t\sqrt{3}\big\rangle$, find the vectors $\vec{T}$, $\vec{N}$ and $\vec{B}$ at the point $(1/\sqrt{2}, 1/\sqrt{2}, \pi\sqrt{3}/4)$. [Since we are at a point, the final vectors $\vec{T}$, $\vec{N}$ and $\vec{B}$ should be independent of t.]