MAC 3313 Calculus 3 **Test 2** 29 Feb 1996

Show **ALL** work for credit; be neat; and use only **ONE** side of each page of paper.

1. Find the equation of the tangent plane to $f(x,y) = x^2 + y^2$ at $(3,4)$.

2. Use the chain rule to find $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$ if $z = xe^y + ye^{-x}, x = e^t$ and $y = st^2$

3. Set up but do **NOT** evaluate the interated integral (or sum of interated integrals) for the volume under the surface of $z = xy\cos(x+y) + e^x\sqrt{2y+8}$ and above the region bounded by $x = y^2$ and $x + y = 2$.

4. Find the directional derivative of $f(x,y,z) = \sqrt{xyz}$ at the point $(2,4,2)$ in the direction of the vector $\langle 4, 2, -4\rangle$.

5. The function $f(x,y) = x^3 - 3xy + y^3$ has a pair of critical points find them and determine if they are local minimums, local maximums or saddle points.

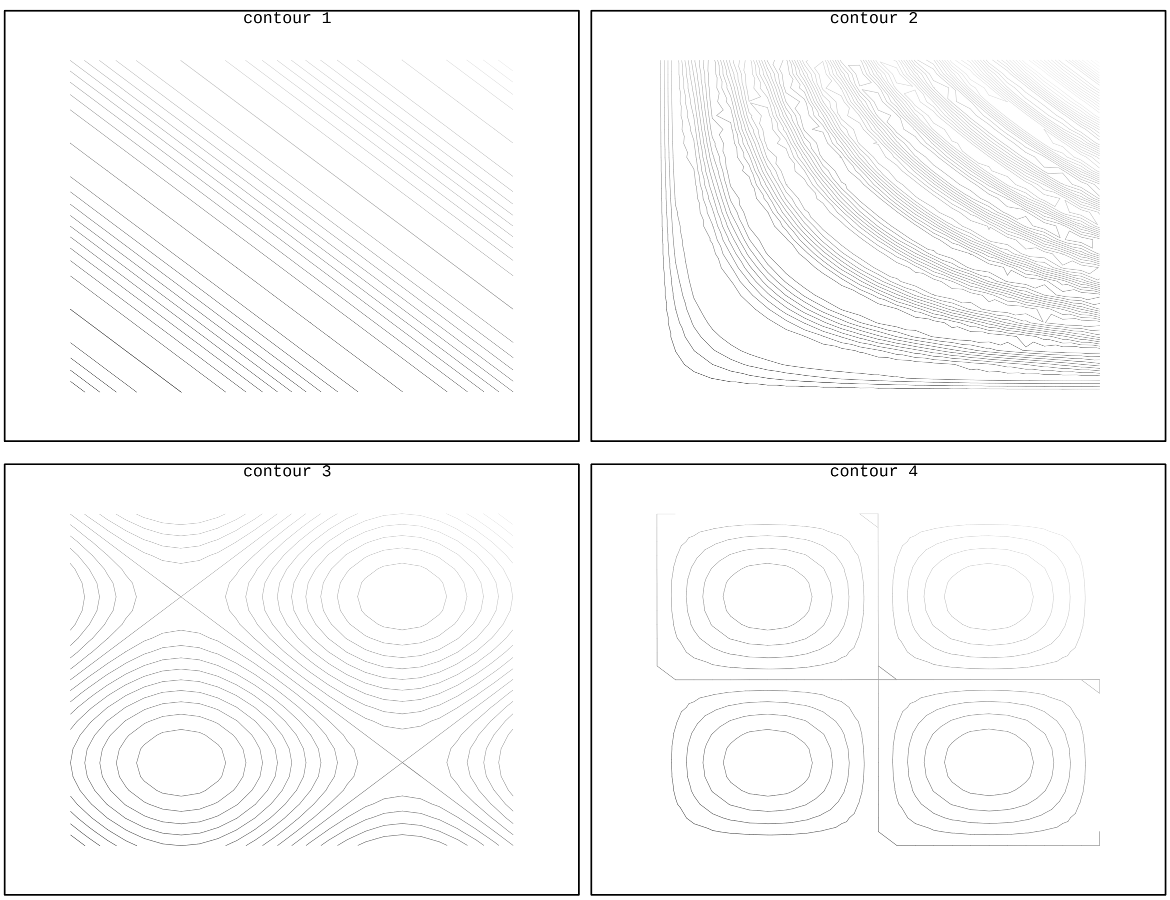
6. Show the limit $\lim_{(x,y)\to(0,0)} \frac{2xy}{x^2+2y^2}$ does not exist.

7. Sketch the region of integration and change the order of integration of $\int_1^2 \int_0^{\ln x} f(x,y)\ dydx$

8. Use Lagrange multiplers to find the maximum and minimum values of $f(x,y) = x^2 - y^2$ subject to the constraint $x^2 + y^2 = 4$.

9. Compute the mass of the lamina of the region in the first quadrant inside $x^2 + y^2 = 9$ and outside $x^2 + y^2 = 1$ with density $\rho(x,y) = e^{-(x^2+y^2)}$. Polar co-ordinates might come in handy.

10. Below are maple contour plots of the functions (in some order) of $\sin(x)\sin(y), \sin(xy), \sin(x) + \sin(y)$ and $\sin(x+y)$ Identify which is which. The plots are over $[0, 2\pi] \times [0, 2\pi]$.



Maple contour plots