

Second Examination

Wednesday, March 11, 2015

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. You may keep this exam sheet. Each problem is worth 25 points.

1. Find an equation for the tangent plane to $f(x, y) = x^2 \cos(xy)$ at $x = 1$, $y = \pi/2$.
2. Find $\frac{df}{dt}$ at $t = 1$ using the chain rule, where

$$f(x, y) = (x^3 + y^2)^{10} \quad \text{and} \quad x(t) = e^{t-1}, \quad y(t) = \sin\left(\frac{\pi}{2}t\right).$$

Express the result as a number.

3. Where are the local maxima, local minima, and saddle points for the function whose contours appear in Figure 1? Explain.
4. Use Lagrange multipliers to find the minimum of $f(x, y) = x^2 + y^2$ subject to $g(x, y) = x + y = 1$.
 - (a) Show all your work.
 - (b) Sketch a graph with the constraint, one or two contours of f , and label the point at which the minimum occurs.

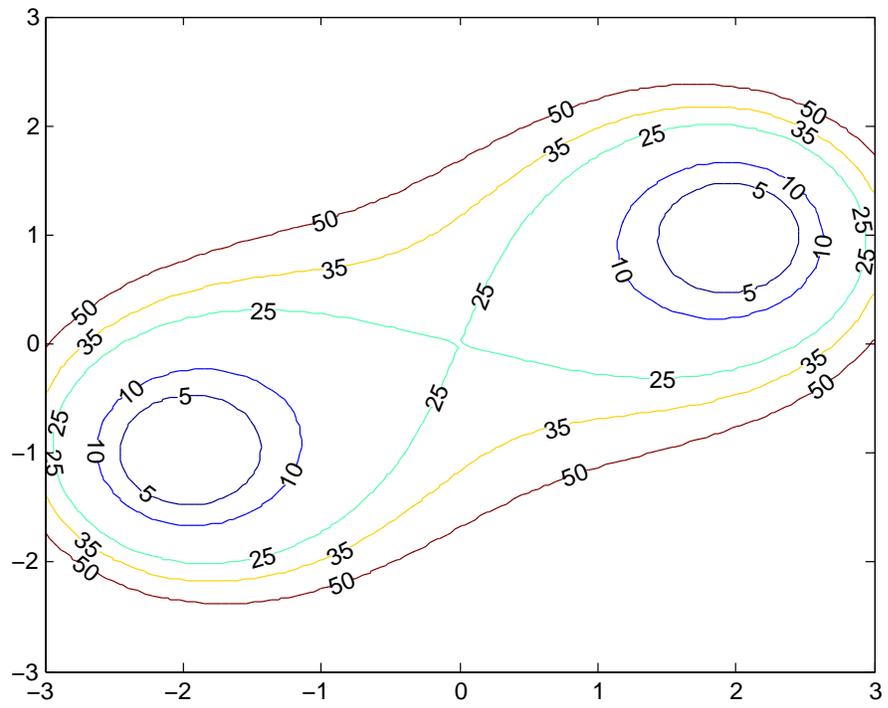


Figure 1: The contour diagram for Problem 3.