

18.02 Recitation
Problems
03 October 2011

1. (13.5.12) Find the critical points of $z = 2xy \exp\left(-\frac{1}{8}(4x^2 + y^2)\right)$.
2. Consider the function $ax^2 + by^2$. It has a critical point at $(0, 0)$. For what a and b is it a minimum? When a maximum? When a saddle point? Sketch a graph of this function in each case.
3. (2F-1b). Find the point on the surface $x^2 - yz = 1$ which is closest to the origin. (Hint: minimize the square of the distance, instead of the distance itself).
4. Find the maximum value of the function $f(x, y) = (x - 1)^2 + y^2$ on or inside a circle of radius 2 centered at $(0, 0)$.
5. What is the maximum value of the area of a rectangle whose total perimeter is less than or equal to ten? The answer may be obvious to you, but try to do the problem using our new methods.
6. How would you do a least-squares regression to fit a quadratic $y = x^2 + bx + c$ to a set of points (assume the leading coefficient is 1). Check this in the case that only two points are given: $(0, -4)$ and $(1, 1)$.
What if the leading coefficient were not assumed to be 1? Can you fit a quadratic of the form $ax^2 + bx + c$?
7. (13.5.56) What is the maximum possible volume of a rectangular box whose longest diagonal has fixed length L ?