

18.02 Recitation
Problems
12 October 2011

1. Think back to the topographic map from last week. In what direction does the gradient point at the spot indicated below?
2. Suppose you hike northeast. Estimate the gradient and the directional derivative $D_{\langle 1,1 \rangle} h$.
3. (2D-5) The temperature at (x, y, z) is given by $f(x, y, z) = x^2 + 2y^2 + 2z^2$. Suppose you are at $(1, 1, 1)$. In what direction should you go to get the most rapid decrease in f ? How far should you go in this direction to get a decrease of 1.2? In what directions is the temperature constant? How far should you go in the direction $\langle 1, -2, 2 \rangle$ to get an increase of 0.10?
4. Consider the surface defined by $x^4 + y^4 + z^4 = 18$. What is the tangent plane to this surface as $(2, 1, 1)$?
5. (2I-2) What point P on the in the first quadrant and on the surface x^3y^2z is closest to the origin?
6. (2I-4) In an open-top wooden drawer, the two sides and back cost 2/sq. ft., the bottom 1/sq. ft. and the front 4/sq.ft. Using Lagrange multipliers, show that the following problems lead to the same set of three equations in , plus a different fourth equation, and they have the same solution.
 - (a) Find the dimensions of the drawer with largest capacity that can be made for a total wood cost of 72.
 - (b) Find the dimensions of the most economical drawer having volume 24 cu. ft.