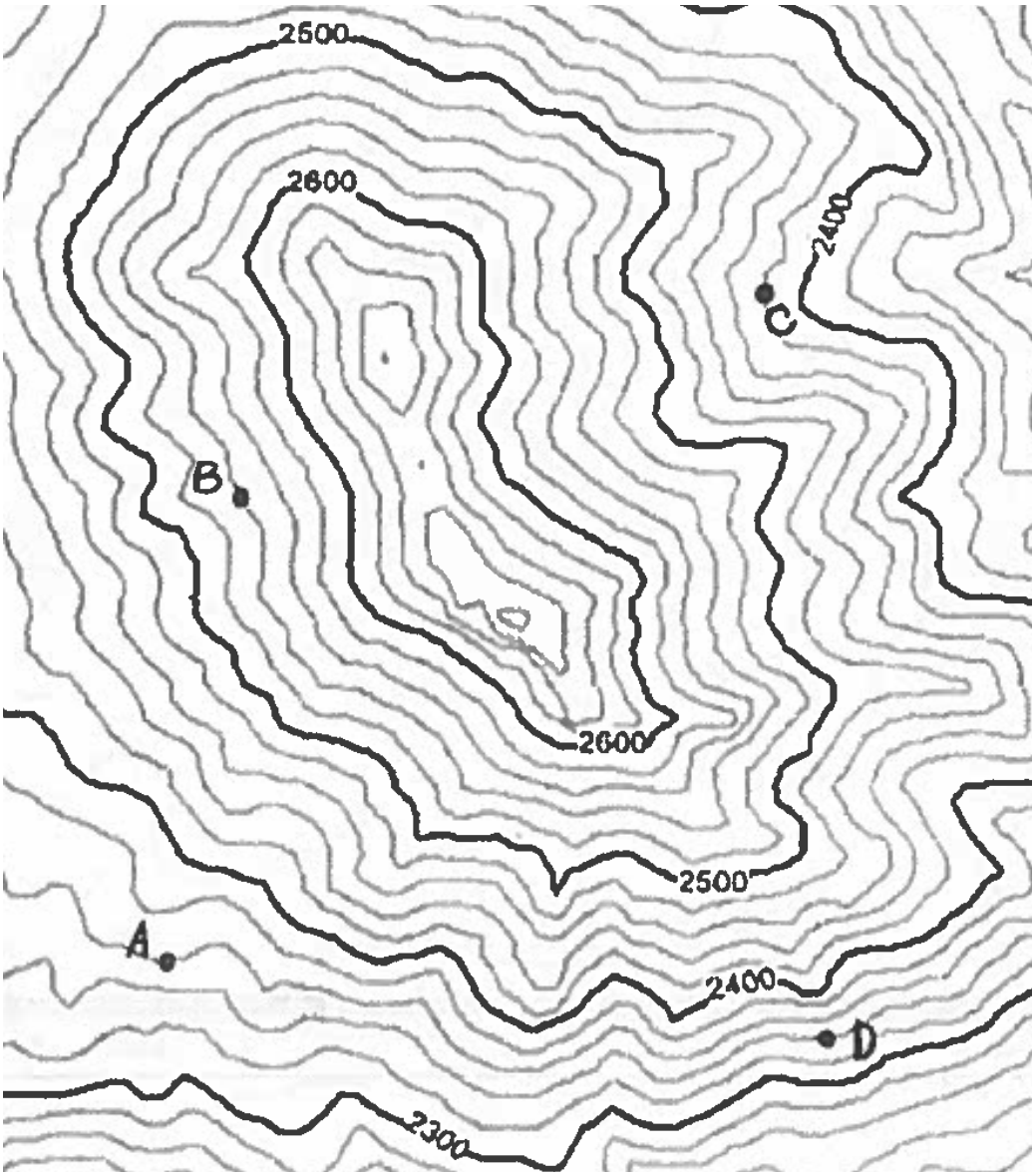
Math 211 Gradients and directional derivatives

1. The topo map below shows level curves of height on a hill, marked in feet. Sketch gradient vectors at each of the points A, B, C, D. At which of these 4 points is the slope the steepest if you step in the direction of the gradient?



Suppose you are standing at point A and you follow the steepest direction with each step. Sketch the path you will follow.

2. Suppose the temperature in a region is given by $T(x,y) = \frac{110}{x^2+y^2+2}$ °F.
    a. Sketch a few level curves of *T*, marking the temperature on each one.
    b. Where is the temperature hottest? What is that hottest temperature?
    c. Find the unit vector in the direction of greatest increase in temperature at the point (2,3). Sketch this direction on your graph of level curves.
    d. Is the temperature increasing or decreasing in the direction $\langle \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \rangle$ at the point (2,3)?

3. Find all directions in which the directional derivative of $f(x,y) = ye^{-xy}$ equals 1 at the point $(0,2)$.