Math 208, Ledder Half Exam 1: 09/07/12 Name _____

Show your work for full credit. Simplify results.

1. (6 points each) Let $\mathbf{a} =< 0, 4, -3 >$ and $\mathbf{b} =< 1, -3, 2 >$, and let P be the point $(2, 0, -1)$.

   (a) Find a vector that is normal to both $\mathbf{a}$ and $\mathbf{b}$.

   (b) Find the equation of the plane that contains P and is normal to $\mathbf{b}$. You may leave your equation in any convenient form.

   (c) Find the projection of the vector $\mathbf{b}$ onto the vector $\mathbf{a}$; that is, find the component of the vector $\mathbf{a}$ that is parallel to the vector $\mathbf{b}$.

2. (6 points) Sketch the surface defined by $4 - y^2 = z^2 - x^2$. Your sketch does not need to be accurate, but it must correctly show the general shape and orientation in the coordinate system.

3. (4 points) Explain how you can tell from a contour plot that a function is linear.

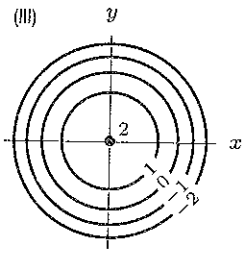

Figure 1

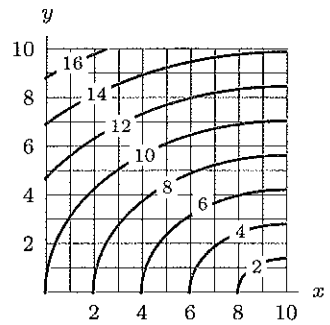

Figure 2

4. (6 points) Figure 1 shows contours for a function $f(x, y)$. Sketch the graph of the surface $z = f(x, y)$.

5. (8 points) Approximate $f_x(3, 5)$ from the contour plot of Figure 2. Show your calculations and mark the points on the contour plot that you are using for the calculations.

6. (8 points) Show that $\lim_{(x,y)\to(0,0)} \dfrac{3x^2}{x^2 + y^2}$ does not exist.

7. (10 points) Two canoeists want to go directly west across a river that flows south with current 2 km/hr. Determine the direction the canoeists should aim their boat, assuming that their velocity is 4 km/hr relative to the water.