AMS261 Practice Midterm 1 V2.

This is another pratice exam for midterm 1.

This exam is closer to the actual exam than the previous version, in that there are less parts in each of the problem.

You may use a calculator for this exam. You must show work to receive full credit. An answer without any kind of work will not be credited, even if it is correct.

1. Let A and B be planes represented by equations $0 = -x + y + 2$ and $0 = -2x + y - 2z$.

   (a) What is the angle between plane A and plane B? 45 degrees or 135 degrees.

   (b) Find a plane perpendicular to plane A and plane B. $-2x - 2y + z = 0$

2. Let C be a plane given by the equation $4 = 5x - 2y + 7z$, and let $\vec{v} = 3\hat{i} + 4\hat{j} - 7\hat{k}$. Find the projection of $\vec{v}$ onto plane A.

   $< 5.6923, 2.9231, -3.2308 >$

3. There is a hiker climbing the surface $f(x, y) = x^2 - 5x + y^2$ at the point (-1,1)

   (a) The hiker wishes to climb the steepest ascent. What direction should the hiker move? (Note: Direction should be given as a unit vector.)
   $\frac{1}{\sqrt{53}} < -7, 2 >$

   (b) Draw a contour diagram for the function with $z = 4, 7, 9$. Sketch the vector from the previous part on the contour diagram.

   (c) Find the equation of the tangent plane at the point (-1,1).
   $(z - 7) = -7(x + 1) + 2(y - 1)$

   (d) Find a vector that is tangent to the curve of the steepest ascent.
   $< -7, 2, 53 >$

4. $f(x, y) = x - 1/x + xy - x/y$ Find all local maxima, local minima, saddle points of this function.

   This function does not have any local extrema or saddle points.

5. $f(x, y) = z$ is a function whose contour is given on pg. 710, Fig 14.32. Suppose that $x(u, v) = 2uv$ and $y(u, v) = u^2 + v^2$.

   (a) Approximate f_u and f_v when $u = 1$, $v = 1$. Answers may vary.

   (b) Approximate f_u and f_v when $u = 0$, $v = 0$. 0