Math 2101 Calculus III
Test #2 Practice

This is a sample of the type of questions to expect on the test. The test will be 5 questions long (some questions will have multiple parts). You should also be prepared to answer questions similar to homework questions, and examples in the test. In other words, this list of questions is by no means complete!

You will not be allowed to bring in calculators on the test.

We will go over the solution to some of these problems during the review the day before the test.

1. Find the domain and range of the function $f(x, y) = \arctan(y/x)$. Sketch the domain in the xy-plane. Then classify the domain as open/closed/neither, bounded/unbounded.

2. Show that $\lim_{(x,y)\to(0,0)} \dfrac{x^2}{x^2 - y}$ does not exist.

3. At what points is the function $w(x, y, z) = \dfrac{1}{|xy| + |z|}$ not continuous?

4. Show that the product of the x, y and z intercepts of the tangent plane to the surface $xyz = \pi$ does not depend on which point you construct the tangent plane.

5. Find the directional derivative of $f(x, y) = x^2y + \ln y$, $y > 0$, at the point (1,1) in the direction of the origin.

6. Consider the surface given by $z = xy^3 - x^2y$. Find an equation for the tangent plane to the surface at the point (3,2,6). Also, find parametric equations for the normal line to the surface at the point (3,2,6).

7. Find the local maximum, minimums, and saddle points of the function $f(x, y) = 2x^3 + 4y^3 + 3x^2 - 12x - 192y + 5$.

8. Find the shortest distance from the point (2,-2,3) to the plane $6x + 4y - 3z = 2$.

9. Find the minimum value of the function $f(x, y) = 2x^2 + y^2$ subject to the constraint $xy = 2$.

10. Use the method of Lagrange multipliers to find points on the surface $x^2 + y^2 + z^2 = 3$ where the function $f(x, y, z) = x + y + z$ has a minimum and maximum.