

## Math 2210-5      Review for Exam 1

Below is a list of problem. These are the types of problems you might see on the exam. Certainly, not all of these problems will appear on the exam (there isn't enough time for that); and it is entirely possible that a problem will appear on the exam which does not fit into any of these types.

1. Given a function of two variables (either in formulaic, graphical, or tabular form), draw contours or sections of the function. Interpret their meaning.
2. Graph a function; draw its contour diagram.
3. Given an equation in  $x$ ,  $y$ , and  $z$ , graph the resulting equation.
4. Graph the level surfaces for a function of three variables,  $G(x, y, z)$ .
5. Find the distance between various objects in three dimensions.
6. Given an equation of a surface, find the equations of the curves where it intersects the coordinate planes; find the points where it intersects the coordinate axes.
7. Match a function to its graph or contour diagram.
8. Understand and use the *geometric* definitions for each of the vector concepts we've learned (vector, addition, subtraction, scalar multiplication, magnitude, dot product, and cross product).
9. Sketch velocity and acceleration vectors for an object moving through space.
10. Estimate, compute, and/or interpret partial derivatives for a function.
11. Given a function, find its tangent plane, and its differential (which is the tangent plane in local coordinates).
12. Use a differential to estimate small changes in a function given small changes in its inputs.
13. Compute directional derivatives.
14. Compute and interpret the gradient of a function. Given a contour diagram, sketch the gradient based on the contours.
15. Given the equation for a surface, use the gradient (of a function of three variables) to find (1) the normal vector to the surface at a point; (2) the tangent plane to the surface using that normal vector.