Math 251 Exam 1 Concepts to know

- Vector and parametric equations of a line; direction vector.(11.4)

- Line as intersection of two nonparallel planes.(11.4)

- Equation of plane; normal vector; parallel planes; orthogonal planes; angle between two planes.(11.4)

- Quadric surfaces (standard equations of ellipsoids, paraboloids, cones and cylindric surfaces; sketch the graph, complete square method).(11.5)

- Vector functions: component functions, domain of definition, derivative.(11.6)

- Space curve, tangent vector and tangent line.(11.6)

- Functions of two variables, domain of definition and their graphs, level curves.(12.1)

- Functions of three variables, level surfaces.(12.1)

- Partial derivatives of first and second orders. (12.3)

- Equation of a tangent plane to the graph of $z = f(x, y)$ (or, to a surface $z = f(x, y)$). Normal vector to this tangent plane.(12.4)

- Differential (applications: use differential to find an approximate value of an expression and to estimate the maxumum error).(12.4)

- The Chain Rule (application: "rate problem").(12.5)

- Implicit differentiation (case $F(x, y, z) = 0$).(12.5)

- Directional derivative of function of TWO variables, gradient and its significance (including maximum value of the directional derivative or maximum rate of change).(12.6)

- Directional derivative of function of THREE variables, gradient and its significance (including maximum value of the directional derivative or maximum rate of change), tangent planes to level surfaces and normal line.(12.6)

- Local maximum and minimum values; critical point, saddle point, second derivatives test. (12.7)

- Any additional topic discussed in class