Outline for Exam 1

1. Coulomb’s Law: how to apply to collections of point charges
2. Insulators vs conductors
3. Electric fields: definition, visualizing with lines of force, calculating for collection of point charges and for simple continuous objects
4. Scalars fields and partial derivatives: \( \frac{\partial z}{\partial x} \) and \( f_x \) notation, computation, interpretation, chain rules
5. Directional derivatives: \( D_u f(x,y) \) notation, computation, interpretation
6. Electric potential energy: connection with work done by electric force and by external force to assemble charges
7. Gradient: \( \nabla f(x,y) \) notation, use in writing directional derivatives, significance of direction and magnitude, application to finding direction of largest and smallest and zero directional derivatives, application to finding the largest and smallest directional derivative, relationship to level curves and level surfaces, application to finding normal lines and tangent planes
8. Conservative vector fields: definition in terms of gradient, independence of path for line integrals, how to find scalar potential functions and their use in computing line integrals
9. Surfaces: parametric descriptions

Be familiar with all assigned homework and ideas from the labs.