Math 2210. Fall 2010. Topics for the Final Exam

Below is the list of main topics for the final exam.

(1) **Lines, planes, curves, surfaces** (ch. 11-12):
   (a) equations, parametric equations;
   (b) intersections, perpendicular, parallel lines, planes;
   (c) tangent line to a curve, tangent plane to a surface.

(2) **Optimization** (ch. 12):
   (a) critical points;
   (b) local extrema, second partial derivatives test;
   (c) global extrema, Lagrange multipliers;
   (d) directional derivatives, direction of fastest increase.

(3) **Areas and Volumes** (ch. 13):
   (a) surface areas and planar areas, volumes (double and triple integrals, cartesian, polar, cylindrical, spherical coordinates);
   (b) center of mass.

(4) **Vector fields** (ch. 14):
   (a) basics: sketch representative vectors, types of vector fields (conservative, rotational, etc.), gradient ∇f, divergence $divF$, $curlF$ for two and three dimensional vector fields;
   (b) line integrals: compute by using parametric equations, use FTC, independence of path for conservative vector fields;
   (c) Green's theorem (for two-dimensional vector fields): compute work $\int_C F \cdot dr = \int_C M dx + N dy$, flux $\int_C F \cdot n \; ds = \iint_S divF \; dA$, circulation $\int_C F \cdot T \; ds = \iint_S curlF \cdot k \; dA$.