#### Math 2210-4 Review Sheet for first exam February 12, 2005

Our first exam is on Wednesday February 16, in class, from 11:50-12:50. The exam will cover sections 13.1-14.6 from our text; in other words, all of chapters 13-14 except for section 14.7. In the outline below you should know each topic - have formulas memorized unless otherwise indicated! We will go through this sheet on Monday February 14 and fill in details, which is why the spacing is generous.

# **Topics**

## vectors and points

points in the plane and 3-space. Coordinate boxes, rectangles and line segments defined by equalities and inequalities in x,y,z

algebra and geometry of vector addition, scalar multiplication, magnitude, i,j,k (13.2, 13.3, 14.1)

#### dot product

definition (13.3, 14.2) algebraic properties (13.3)

geometric formula (13.3, 14.2) angle between vectors

equations of planes finding a plane equation from various pieces of information

angle between intersecting planes

projection

components

work

distance from a point to a plane (Could you explain this formula if reminded of it? Could you use it?)

# cross product (14.3)

definition

geometric formulas direction

magnitude

areas of parallelgrams, triangles

cross and dot product together (14.3, 14.4)

volumes of parallelepipeds

formulas to compute distance from point, line or plane to line or plane.

(Could you explain why such a formula is true, if given the formula? Could you use the formula?)

**surfaces** as graphs of equations in three-space (14.6) planes, cylinders, quadric surfaces

identification of surface from its equation, i.e. from among the choices of plane, cylinder, ellipsoid, 1 and 2-sheeted hyperboloids, elliptic and hyperbolic paraboloids?

sketching a surface with the aid of trace curve sketches in coordinate (or parallel) planes.

## parametric curves (13.1, 13.4, 13.5, 14.4, 14.5)

showing a parametric curve lies on the graph (solution set) of an equation. for a plane curve relate dy/dx to the tangent vector  $\langle dx/dt, dy/dt \rangle$ 

position vector, velocity (tangent) vector, acceleration vector how to compute, where to draw, geometric and physics meanings

differentiation rules for vector-valued functions (sum, products, chain)

lengths of curves

unit tangent and normal vectors (Could you find T for any curve, N at least for a plane curve? No binormal B on exam)

curvature (Do you understand how to compute curvature from the various formulas?)

circle of curvature (Could you find the circle of curvature for a plane curve?)

decomposition formula of acceleration into tangential and normal components (Do you understand this formula, if reminded of its precise form? Can you work in various ways with this formula, such as in the extended problem 36 in last hw assignment? Could you explain how this formula is derived? Could you use it to get the formula(s) for curvature?)