Math 21a Study Guide for Math 21a Hourly 1

What follows are a list of topics and issues that may arise on the first hourly exam. Though not exclusive, the list is provided to help you identify some of the salient topics that the course covers in Chapter 1 and Appendix A of the text book.

In any event, remember that the first houly exam is on Wednesday, October 10, from 7-9pm in Science Center lecture halls C and D (go to either one). Please arrive a few minutes before 7 as we will start timing the exam at 7.

- Given a pair of vectors in R^2 or R^3, be able to add them, subtract them (both analytically and graphically), multiply them by real numbers, take their dot product and take their cross product.
- Understand the basic formula for dot and cross product in terms of vector length and angle between vectors. For cross product, determine the direction of the cross product.
- Manipulate and understand simple algebraic, geometric and trigonometric facts and formulas that involve the dot and cross product.
- Identify orthogonal and parallel vectors. Find vectors orthogonal to a given vector or to a given pair of vectors.
- Find normal vectors to planes, vectors tangent to planes, vectors tangent to lines and vectors normal to lines.
- Given sufficient data, provide parametric and non-parametric descriptions of lines and planes.
- Determine when two planes or a line and a plane intersect or a pair of lines intersect or are parallel. Be able to write down an equation for the points in these intersections.
- Calculate the distance from a point to a given point, line or plane.
- Know how to determine the projection of one vector along another.
- Write one or more parametrizations for given simple paths in R^2 or R^3.
- Provide the velocity vector and acceleration vector for a particle with given time dependent position vector.
- Provide the unit tangent vector to a given parametrized path at a given point in time.
- Solve simple problems involving particles moving along parametrized paths. For example, be able to tell when a particle crosses a given plane, is moving tangent to a given line, is closest to a given point.
- Differentiate and otherwise manipulate dot and cross products of vector functions of time.
- Develop an expression for the length of a given parametrized path as an integral.
- Sketch a graph of a given parametrized path (even in polar coordinates).

- Understand the relation between polar coordinates and standard Cartesian coordinates for $\mathbb{R}^2$.