Math 2210Q-004 Review Sheet for Exam 2

Exam 2 is Thursday, April 9, 2009, in class.

Covering text sections 3.1 – 3.3, 4.1 – 4.7

Review Suggestions:

* Use Supplemental Exercises lists for Chapters 3 (p. 211) and 4 (p. 298) to assess your mastery of the material. Try the following questions from the Supplementary exercises:
  - Chapter 3: 1-5, 13, 14
  - Chapter 2: 1-6, 11, 13 (this can be done independent of #12, think of using row operations and corresponding elementary matrices), 14
* Reread and study class notes!
* Rework class quizzes with books and notes closed, go over all the email assignments.
* Rework exercises from the various sections as time permits, again without referring to your notes or other parts of the text.
* Come see me in office hours to clarify any points that you are not completely clear about. If you can't make office hours, let me know and we can meet at other times.

Things to concentrate on:

- Section 3.1: Finding the determinant of a square matrix by cofactor expansion across any row or any column; the determinant of a triangular matrix.
- Section 3.2: How row operations can be used in calculating the determinant; Theorems 3, 4, 5 & 6.
- Section 3.3: Cramer's Rule; Theorem 8; using determinants to find areas and volumes.
- Section 4.1: Definition of a Vector Space; examples of vector spaces (lots of them); definition of a subspace; how to show that a subset of a vector space is a subspace; the concepts of spanning and linear independence as they apply to vectors in a general vector space.
- Section 4.2: The null space and column space of a matrix; the kernel and range of a linear transformation; comparing and contrasting $\operatorname{Nul} A$ and $\operatorname{Col} A$.
- Section 4.3: Definition of a Basis; theorem 4; Finding bases for $\operatorname{Nul} A$ and $\operatorname{Col} A$; knowing how spanning sets can be reduced to a basis and a linearly independent set of vectors can be expanded to a basis.
- Section 4.4: How to express a vector in terms of a given basis; Theorem 7; The change-of-coordinates matrix $P_{\mathcal{B}}$; the coordinate vector of $\vec{x}$ relative to a basis $\mathcal{B}$; Theorem 8; isomorphism of vector spaces.
- Section 4.5: Theorems 9 and 10 and the definition of the dimension of a vector space; Theorem 12; How do free variables and pivot positions in a homogeneous system of equations relate to the dimension of $\operatorname{Nul} A$ and $\operatorname{Col} A$.
- Section 4.6: The row space of a matrix; The rank of a matrix and how it relates to the dimension of the row space and column space of a matrix; how to find a basis for the row space of a matrix; The Rank Theorem; Rank and the invertible matrix theorem.
- Section 4.7: Change of basis matrices $\underset{\mathcal{C}\leftarrow\mathcal{B}}{P}$; The relationship between the change-of-coordinate matrices (from section 4.4) and the change of basis matrices from section 4.7: $\underset{\mathcal{C}\leftarrow\mathcal{B}}{P} = P_{\mathcal{C}}^{-1}P_{\mathcal{B}}$ along with how to efficiently compute the change of basis matrices: $\left[\, P_C \,\middle|\, P_B \,\right] \Longrightarrow \cdots \Longrightarrow \left[\, I \,\middle|\, \underset{\mathcal{C}\leftarrow\mathcal{B}}{P} \,\right]$.