MATH 2110Q
Fall 2010
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Exam 1 Guidelines: Material and Review Suggestions

Date and place: Tuesday, October 5, in class
Additional office hours before exam: Monday, October 4, 1:00 – 2:00
Policies: No MAKE-UPS.
This is a one-hour exam, but all students may stay for as long as they need to finish the exam.

Material:

- Chapter 12: sections 12.1, 12.2, 12.3, 12.4, 12.5, and chapter 13: sections 13.1, 13.2
- Homework points total = 12 points (1 point per each section, group-work, review, and the Mathbio)
- Exam 1 total points = 88 points
- You may bring a Scientific Calculator (but not a programmable or symbolic calculator)
- You may bring the review of Calculus I and II packet handout
- You may not bring any other notes or handouts

The exam will cover the material from chapter 12: sections 1-5, and chapter 13: sections 1-2 that we discussed in class and studied in the homework assignments. Suggested review: The REVIEW QUIZ, EXERCISES, and CONCEPT CHECK at the end of each chapter (only those exercises that are on the material we studied in class), and exercises in the same groupings as those assigned as homework problems.

Section by section highlights you should master:

Chapter 12

Section 12.1
Concepts: The coordinate system
Theorems and formulas: Distance formula between two points in space or plane (box on page 767), the equation of a sphere with given center and radius (box on page 768)
Skills: Calculate distance between two points, find the equation of a sphere when given various conditions, determine when a quadratic equation is an equation of a sphere (by completing squares to find center and radius)

Section 12.2
Concepts: Addition and subtraction of vectors (geometrically and algebraically), multiplication of a vector by a scalar (geometrically and algebraically), standard position representation of a vector, length of a vector, the standard basis vectors **i**, **j**, and **k**, unit vector
Theorems and formulas: length of a vector (formula on page 773), standard position of a vector (box 1 on page 773), properties of vectors (box on page 774), vector representation in terms of standard basis ((page 775)
Skills: adding and subtracting vectors, and multiplying vectors by scalars (algebraically and geometrically), calculating length of vectors, calculating a unit vector in the direction of a given vector, finding the standard position representation of a vector, expressing a vector in terms of the standard basis vectors **i**, **j**, and **k**, determine when two vectors in standard position are parallel

Section 12.3
Concepts: The dot product of two vectors, the angle between two vectors
Theorems and formulas: Properties of the dot product (box 2 on page 779), $\cos\alpha = \frac{\vec{u}\cdot\vec{v}}{\|\vec{u}\|\|\vec{v}\|}$ (Corollary 6 on page 780), $\vec{u}$ is orthogonal to $\vec{v}$ iff $\vec{u}\cdot\vec{v} = 0$ (box 7 on page 781)
Skills: Calculate the dot product between vectors, calculate the angle between vectors, use the dot product to determine when two vectors are orthogonal

Section 12.4
Concepts: The cross product of two vectors
Theorems and formulas: **u** x **v** is orthogonal to both **u** and **v** (Theorem 5 on page 788), **u** x **v** = 0 iff **u** and **v** are parallel (Corollary 7 on page 789), the length of **u** x **v** is equal to the area of the parallelogram determined by **u** and **v** (box on page 789), properties of cross product (Theorem 8 on page 790)
Skills: Calculate cross product of vectors using determinants, use the properties of the cross product to find vectors orthogonal to two vectors, and areas of triangles and parallelograms

Section 12.5
Concepts: Parametric and vector equations of a line in space, direction vector, equation of a plane, normal vector, parallel lines, orthogonal lines, angle between planes
Theorems and formulas: Parametric and vector equations of a line in space (box 2 on page 795, and box 4 on page 797), equation of a plane in space (boxes 7 and 8 on page 798)
Skills: Calculate the parametric and vector equations of lines given various conditions, decide when lines are parallel or perpendicular, find point of intersection of lines, calculate equations of planes given various conditions, find angle between planes, find the point or line of intersection of two planes, find point of intersection between a line and a plane

Chapter 13

Section 13.1
Concepts: Vector functions, component (or coordinate) functions of a vector function, parametric and vector equation of a curve, parameter, position vector, limits and continuity of vector functions
Theorems and formulas: Limit of a vector function (box 1 on page 817), continuity of vector functions (top paragraph of page 818), parametric equation of curve C (second paragraph on page 818)
Skills: Calculate limits of vector functions and decide when a vector function is continuous, find a vector functions parametrizing a curve, and conversely, describe a curve parametrized by a vector function via an equation in x, y and z.

Section 13.2
Concepts: Derivative of a vector function, tangent vector to a curve, unit tangent vector, tangent line to a curve, indefinite and definite integrals of vector functions
Theorems and formulas: Derivative of a vector function (box 1 and Theorem 2 on page 825), differentiation rules (Theorem 3 on page 826), unit tangent vector (formula above Theorem 2 on page 825), indefinite and definite integral of a vector function (box at bottom of page 827 and first paragraph on page 828)
Skills: Calculate derivatives of vector functions, calculate tangent vectors, unit tangent vectors, and parametic equations of tangent lines to given curves at given parameters, calculate the indefinite and definite integral of vector functions. **Note: All the integrals you may be asked to calculate on this exam can be done using the table of integral formulas, simple substitution, or integration by parts.**