

Midterm Exam 2

Exam: Friday, Dec 3 (starts 9:05 sharp to 10:00).

Review Session: Monday at 8:00pm in Sci Center 309. I will focus more on the older linear algebra material.

Extra office hours: Thursday 1:00 - 3:00, and as always, by appointment (CA's will have additional office hours to be announced)

Problem sessions: Will continue at the usual times unless you hear otherwise.

HW #19 Due Wed December 1: Supplement Section 14.3 # 8(a-b), 9, 10, 12, 20. **Note:** In problem 12, the figure and the text of the problem do not agree. Follow the figure.

HW #20 Due Friday December 3. Do any 10 of the review problems below. On problems where there are several identical sub-problems, you need do only one (this includes when I specify, for instance, #5(a-c) below). This HW will not be graded as usual, but you will simply receive 1 point for each problem turned in. The idea is that by choosing the problems yourself, you can concentrate on the areas that you don't fully understand.

Material Covered: The linear algebra that was not on the first exam and all of the multivariable calculus supplement.

Review problems and course outline

- Subspaces of \mathbb{R}^n : Anton-Rorres 5.2-5.6
 - Definition. Examples of subspaces in \mathbb{R}^2 and \mathbb{R}^3 .
 - Geometric understanding of what a subspace is.
 - Linear combinations of vectors. Span of a set of vectors.
 - Linear independence and bases. Finding bases. Coordinates of a vector in terms of a basis.
 - Subspaces associated to a matrix: nullspace, columnspace, row space. The fact that for a matrix A with n columns: $rank(A) + nullity(A) = n$
 - Review problems: Section 5.2: #1, 11. Section 5.3: #3, 5. Section 5.4: #1(a-b), 3(b-d), 7(b-c), 17, 20. Section 5.5: #6, 9, 11. Section 5.6: #2, 4, 12(a). Chapter 5 Supplementary exercises: 3(a), 5(a).
- Projection and regression: Anton-Rorres 6.4 and 9.3
 - Projection onto a subspace. Geometric meaning of.
 - Least-squares fitting and regression via projection.

- Review Problems: Section 6.4 #4(b), 9(through part c). Section 9.3: #1, 3.
- Functions of several variables: Supplement Ch. 11.
 - Functions of two variables: graphs, slices, level curves, contour diagrams.
 - Graphs, contour diagrams of linear functions.
 - Cobb-Douglas production functions.
 - Functions of 3-variables. Level surfaces.
 - Review Problems: 11.3: #17, 11.4: #34, 11.5: #17.
- Derivatives of functions of several variables: Supplement Ch. 13.
 - Partial derivatives.
 - Local linearity (differentiability) of functions of 2 variables. Normals and tangent planes to a graph. Approximation by linear functions.
 - Directional derivatives.
 - The gradient.
 - Parametric curves.
 - Chain rule.
 - Second order partial derivatives
 - Review problems: Section 13.3 #8 Section 13.4 #7 Section 13.5 #34, #36, Section 13.6 #4, 22. Section 13.7 #26. Chapter 13 Review problems: #41.
- Optimization problems
 - Local and global extrema, critical points, second derivative test.
 - Unconstrained optimization.
 - Constrained optimization: Lagrange multipliers.
 - Review problems: Section 14.2 #5. Chapter 14 Review #5,#7, #9.