

Test layout: 4-5 pages; additional scratch paper will be available to those who want to use it for showing work. Approximately 15 problems plus approximately 2 Extra Credit; No True/False.

Sections covered: 10.1, 10.2, 10.5, 12.1–12.6, 13.1–13.4a, 14.1–14.4, 14.6, 15.1–15.3

Most important skills and concepts for this exam

1. Calculate partial derivatives and gradients.
2. Calculate iterated integrals.
3. Find equations for lines (vector, parametric, symmetric forms) and planes (vector, standard, general forms), including tangent lines and tangent planes.
4. Compute dot and cross products, and use them to find quantities such as projections, areas, and volumes.
5. Evaluate limits of functions of two variables—or show they don't exist.
6. Compute arc length and curvature of curves.
7. Compute directional derivatives.
8. Convert double integrals into iterated integrals.
9. Find the distance between non-intersecting objects in 3-space.
10. Determine the equation of a conic section given its graph or some of its properties, and vice versa.
11. Estimate a double integral using a double Riemann sum (eg. Midpoint Rule)
12. Describe and work with the level curves of a function of two variables.

Other important skills/topics

Determine whether a function of two variables is continuous at a point (or the set where it's continuous); Find the average value of a function of two variables; Identify types of quadric surfaces using graphs or equations; Solve physics problems involving magnitude and direction by using coordinate systems and vectors (e.g. work, torque, velocity, acceleration, force); Perform calculus (limits, derivatives, integrals) on vector-valued functions; Describe the domain of a function of two variables (graphically or in set notation); Eliminate the parameter from a parametric curve; Find the formulas for the slope (dy/dx) and rate of change of slope (d^2y/dx^2) for a parametric curve; At a point, find the *maximum rate of increase* and the *direction* of maximum increase of a function of two variables; Work with geometric forms of vectors and vector operations (as well as the component forms); Find a unit vector parallel to a given vector; Determine the angle between two vectors or two geometric objects that intersect; Determine whether two objects in 3-space intersect, are parallel, or are related in neither of these ways; cross-sections of surfaces; Magnitude of a vector.

Review Exercises: An assignment called *Additional review for final exam* is available on WebAssign. It contains review problems (worth 0 points), together with solutions, just on the material covered since Exam 2. Furthermore, the assignments *Review for Exam 1* and *Review for Exam 2* have been reactivated for review on the previous material. Look at your graded quizzes and exams as well as previous homework assignments including those on WebAssign. Make sure you understand and can do problems of the types on these. **Remember that complete solutions to the WebAssign problems are available once the due date is past.** Voting question files (with correct answers indicated) will be posted on our ANGEL page under Lessons. Also, the textbook includes review exercises (as well as concept checks and true-false quizzes) at the end of each chapter. For the material covered since Exam 2 the following exercises are relevant: 11b, 12, part (a) of 25-29, 31-34, and 41-50 on pp. 945-947 and 1-6, 10, 11, 13-21, 29-31 on pp. 1022-1023. See the previous review sheets for textbook review exercises on the material prior to Exam 2.