Topics for Exam 2
Math 32, Fall 2006

General information. Exam 1 will be a timed test of 50 minutes, covering 12.6 and 14.1–14.7 of the text. Most of the exam will be based on the homework and quizzes assigned for those sections. If you can do all of that homework, and you know and understand all of the ideas behind it, you should be in good shape. Besides the list of things you should know, below, you should also be familiar with everything specially emphasized in the text. If time permits, do problems that have answers in the back of the book.

You are allowed to use a calculator and notes on **ONE** 3×5 note card (both sides).

Section 12.6. Cylinders in 3-D (2-variable equations graphed in 3-D). Special cases: ellipsoids, paraboloids, saddles (hyperbolic paraboloids).

Section 14.1. Idea of a function of two variables: domain, range. Representing a function by a table; interpreting real-life ideas of a function. Graph of $z = f(x, y)$: definition, pick-a-point method, using traces. Contour map of $z = f(x, y)$: definition, level curves, interpreting contour map (steepness). Matching/translating among formula, graph, and contour map. Functions of more than 2 variables.

Section 14.3. Definition of partial derivative. Notation: f_x, $\dfrac{\partial f}{\partial x}$, $\dfrac{\partial}{\partial x} f(x, y)$, $D_x f$, etc. Computing partial derivatives. Interpretation of partial derivatives: slopes, rates of change. Higher derivatives. Functions of more than two variables.

Section 14.4. Finding equation of tangent plane. Linear approximation/tangent plane approximation. Functions of 3 or more variables.

Section 14.5. Chain rule in various cases. Tree diagram/path diagram. Examples with formulas, examples without formulas.

Section 14.6. Directional derivatives: idea, definition. Gradient $\nabla f(x, y)$; $D_{\mathbf{u}} f(x, y) = \nabla f(x, y) \cdot \mathbf{u}$. Functions of 3 or more variables. Meaning of gradient: Direction of greatest increase is in direction of $\nabla f(x, y)$, magnitude of $\nabla f(x, y)$ is greatest possible increase, gradient is perpendicular to level curves.

Section 14.7. Basic definitions: local/absolute min, local/absolute max, critical point. Local max/min implies critical point. Finding critical points by setting $f_x = 0$ and $f_y = 0$. Classifying critical points by Second Derivatives Test.

Not on exam. (14.2) This section will not be covered on the exam. (14.3) Partial differential equations. Cobb-Douglas function. (14.4) Definition of differentiable. Differentials. (14.5) Implicit differentiation; implicit function theorem (pp. 936–937). (14.6) Tangent planes to level surfaces. (14.7) Finding absolute max and min values of a function (checking the boundary).