Topics for Exam 3
Math 32, Fall 2015

General information. Exam 1 will be a timed test of 75 minutes, covering 14.7–14.8, 15.1–15.3, 10.3, 15.4–15.5, and 15.7–15.8 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 (not a TI-89, TI-92) and notes on **ONE** 3×5 note card (both sides).

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. Idea of finding absolute max and min values of a function (checking the boundary).

Section 14.8. Basic goal: Optimize $f(x, y, z)$ on level surface $g(x, y, z) = k$. Method of Lagrange Multipliers. Examples of solving 4 equations in 4 variables.

Section 15.1. Riemann sums: subdividing rectangle, sample points, volumes of columns. Definition of double integral; interpretation of double integral as volume.

Section 15.2. Interated integral. Calculating double integrals by calculating iterated integrals.

Section 15.3. Basic idea of double integrals over general regions (inner limits are functions of outer variable). Type I (integrate y first): bottom/top walls are functions $y = f_1(x)$, $f_2(x)$; Type II (integrate x first): left/right walls are functions $x = g_1(y)$, $g_2(y)$. Other properties of double integrals (additivity, additivity of region, etc.).

Section 10.3. Basic definitions: Polar coordinates, (r, θ); interpretation of positive and negative r. Formulas: $x = r\cos\theta$, $y = r\sin\theta$, etc.

Section 15.4. Basic idea; conversion formulas $x = r\cos\theta$, $y = r\sin\theta$, fudge factor $r\,dr\,d\theta$.

Section 15.5. Density and mass (formula, interpretation). Moments and centers of mass (formula, interpretation). Moment of inertia I_0 about the x and y axes and origin (formulas, interpretation).

Section 15.7. Calculating triple integrals by calculating iterated integrals. Type I (integrate z first): bottom/top walls are functions $z = f_1(x, y)$, $f_2(x, y)$, then integrate over 2-D region in plane. Application: Integral of density is total mass, charge, etc.; center of mass, moments of inertia.

Section 15.8. Basic idea of cylindrical; conversion formulas $x = r\cos\theta$, $y = r\sin\theta$, fudge factor $r\,dr\,d\theta\,dz$.

Not on exam. (10.3) Graph of polar equations $r = f(\theta)$, $F(r, \theta) = 0$. Examples: $r =$ constant, $\theta =$ constant, n-leaved and $4n$-leaved roses. Tangents to polar curves. (15.4) Double integrals in polar coordinates with non-constant limits of integration (pp. 1000–1001). (15.5) Radius of gyration; probability, expected value (pp. 1008–1012).