MA 261 Exam 2 Study Guide

Exam 2 will cover material from lessons 9-18. This is sections 14.6, 14.7, 14.8, chapter 15 (except section 15.9), and sections 16.1 and 16.2.

Exam 1 will be worth 100 points. There are some multiple choice problems and some free response problems. There is no partial credit for multiple choice questions, but partial credit may be awarded for free response questions. You must show all of your work for full credit on the free response questions.

You should be able to do every homework question. Calculators are not allowed on the exam, so the computations will be simple enough to do by hand.

Topics to know:

- Directional derivatives, gradient vector, direction of maximal increase of a function being in the direction of the gradient vector
- Local extrema, second derivatives test (the discriminant will be provided to you, but nothing else), absolute extrema, finding absolute extrema on a closed bounded region by evaluating the function at the boundaries, finding absolute extrema of a function subject to a constraint by using the Method of Lagrange Multipliers
- Double integrals over general regions (including rectangles), setting up a double integral as an iterated integral in either order of integration, computing an iterated integral, switching the order of integration of a double integral, using a double integral to compute the area of a region D in the xy-plane
- Converting a double integral from rectangular to polar coordinates, setting up a double integral in polar coordinates
- Finding the mass and centroid of a lamina with variable density, finding the surface area of a surface $z = f(x, y)$ over a region D in the xy-plane.
- Triple integrals over general regions, setting up triple integrals as iterated integrals in all six orders of integration, computing an iterated integral, switching the order of integration of a triple integral, using triple integrals to compute the volume of a region E in $\mathbb{R}^3$
- Converting a triple integral from rectangular to cylindrical coordinates, setting up a triple integral in cylindrical coordinates, converting a triple integral from rectangular to spherical coordinates, setting up a triple integral in spherical coordinates
- Matching vector fields with their graphs, finding the gradient vector field of a function, computing the line integral of a function along a curve, computing the line integral of a vector field along a curve (using the definition, *not* the Fundamental Theorem for Line Integrals which is not covered on this exam), find the work done by a vector field on an object moving along a smooth curve C.

There is no way that every single one of these topics could be covered on the exam. There will be some sections of the textbook which are completely skipped over on this exam. Please be aware of this.

You should be capable of doing every homework problem (even the ones which are too long and/or difficult to be placed on an exam – I can still ask you how to do parts of these problems, even if I don't ask you to do the full problem).

The following information/formulas will be provided to you, if you need them:

$$D(x,y) = f_{xx}(x,y)f_{yy}(x,y) - \left[f_{xy}(x,y)\right]^2$$

The Method of Lagrange Multipliers states that if $f(x,y)$ attains an absolute extreme value at (a,b) subject to the constraint $g(x,y) = C$ for some constant C, then the gradients of f and g are parallel at (a,b).

$$\sin^2\theta = \frac{1}{2}(1 - \cos 2\theta)$$

$$\cos^2\theta = \frac{1}{2}(1 + \cos 2\theta)$$

<u>Practice Problems you can do, if you want:</u>

<u>Chapter 14 Review</u> (pages 981-984)

Concept Check: #14, 16, 17, 18c

True-False Quiz: #10

Exercises: #43, 46, 47, 53(don't graph), 55, 59

<u>Chapter 15 Review</u> (pages 1061-1063)

Concept Check: #3, 9

Exercises: #9, 10, 19, 23, 28, 34, 40, 41a,b, 44(let $a = 1$), 47(just set it up, don't solve), 48(just set it up, don't solve), 53

<u>Chapter 16 Review</u> (pages 1148-1149)

Exercises: #3, 7, 9, 10

Also do section 16.1 exercises 11-14 (page 1073)