REVIEW FOR MIDTERM III

PRELIMINARIES:

The midterm will be given on Tuesday 20 November in our usual TUESDAY classroom and will be 1 hour. The test is closed-book and closed-note. Calculators are not allowed.

The best preparation for any test is to be diligent and keep up over the weeks preceding the test. The second-best preparation for a math test is to *work* problems – since this is what your test will look like. Working problems should come before: reading and high-lighting your notes, reading and high-lighting the text, "looking over" quizzes and homework.

CHAPTER 15: MULTIPLE INTEGRALS

- Section 1: Double Integrals over Rectangles

  1. You should know how to evaluate a double integral over a rectangular region.

- Section 2: Double Integrals over General Regions

  1. You should know how to set up and evaluate a double integral over a non-rectangular region.
  2. You should know how to reverse the order of integration.
  3. You should know how to use a double integral to find volume.
  4. No question will use or require the language or "type I" or "type 2" regions.
  5. Typical problem types: #1-10 (easy),15-32, 45-56

- Section 3: Double Integrals in Polar Coordinates

  1. You should know how to set up an integral in polar coordinates.
  2. You should know how to convert integrals between polar and rectangular coordinates.
  3. Typical problem types: #5-27, 29-32

- Section 4: Applications of Double Integrals

  1. We looked exclusively at using double integrals to find the mass and center of mass of a lamina with a given density. You should be comfortable with the notation and language of these types of problems including M_x and M_y.
  2. Typical problems: #3-16

- Section 5: Surface Integrals

  1. We learned how to find the area of a surface with some given domain.
  2. I will give you the formula: $A(S) = \iint\limits_D \sqrt{1 + \left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2}\, dA$

- Section 6: Triple Integrals

  1. You should know how to set up and evaluate a triple integral.

2. No question will use or require the language of "type I", "type 2" or "type 3" regions.
3. You should know how to use a triple integral to find the mass and center of mass of a solid. You should be comfortable with the notation and language of these types of problems including M_{xy}, M_{xz} and M_{yz}.
4. typical problems: #3-22, 27-32, 35-26, 39-42
5. Note that you will *not* be asked to give all six different orders of integration but you should expect to be asked to set up or rewrite a triple integral in some subset of these.

- Sections 7 and 8: Triple Integrals in Cylindrical and Spherical Coordinates

1. You should be able to plot points and graph surfaces given in cylindrical and spherical coordinates.
2. You should be able to convert points (equations, integrals) between rectangular and cylindrical and spherical coordinates.
3. I will give you the formulas given to you on Quiz 9:
   Formulas for Spherical Coordinates:
   $z = \rho\cos\phi$, $x = \rho\sin\phi\cos\theta$, $y = \rho\sin\phi\sin\theta$, $dV = \rho^2\sin\phi\, d\rho\, d\theta\, d\phi$.
4. You should be able to set up and evaluate integrals in cylindrical and spherical coordinates.
5. typical problems: 15.7 #1-12, 15-24, 29-30
6. typical problems: 15.8 #1-14, 17-27, 41-43

CHAPTER 16: VECTOR CALCULUS

- Section 1: Vector Fields

1. You should be able to give a rough sketch of a given (not-too-complicated) vector field or identify which among a collection of plots is a given vector field.
2. You should know that the gradient of a function can be viewed as a vector field.
3. You should know what a *conservative* vector field is.
4. typical problems: #1-14, 29-32