

## Midterm Topics

The midterm is on Monday, August 11th, 6:05-8:05 in the usual classroom (Dunn 304). Calculators are not permitted.

You will be expected to be able to state the following definitions and theorems:

- Definition of the double integral.
- Definition of the triple integral.
- Formula for the change of variables for double and/or triple integrals.
- Fundamental Theorem for line integrals.
- Green's Theorem.

You will also be expected to be able to do the following:

### 1. Double Integrals

- Estimate double integrals.
- Calculate double integrals.
- Find areas, volumes, and the centre of mass of shapes using double integrals.
- Use polar co-ordinates to evaluate double integrals.
- Change variables in a double integral.

### 2. Triple Integrals

- Calculate triple integrals.
- Find volumes and masses of solids using triple integrals.
- Use spherical co-ordinates (the formula to change to spherical co-ordinates will be provided on the exam).

### 3. Vector Fields

- Graph vector fields.
- Calculate gradient fields.

- Determine if a (two-dimensional) vector field  $\mathbf{F}$  is conservative.
- Find  $f$  such that  $\Delta f = \mathbf{F}$  (if  $\mathbf{F}$  is conservative).

#### 4. Line Integrals

- Calculate line integrals.
- Use line integrals to calculate the work done by a vector field.
- Use the fundamental theorem of line integrals.
- Use Green's theorem.

Practice problems in each section are on the website:

<http://www.mathstat.dal.ca/~cruttw/Math2002.htm>