The final exam will be administered Wednesday, December 11th 3:00-6:00pm in **Rolfe 1200** (this is **not** our usual classroom). No makeup exams will be given. The exam is cumulative, covering Chapters 16-18 in the textbook. No electronic devices will be allowed including cell phones, laptops, or calculators, but you may bring one 3×5 inch notecard with notes and/or formulas on the front and back. **You must bring your student ID to the exam**. Scratch paper will be provided.

You should study old homework, worksheets, exams, lecture notes, and these sections of the textbook. You may also find it helpful to do problems in the textbook for each section as well as the Chapter Reviews for Chapters 16, 17, and 18.

Skills List

In general you are expected to know and understand all definitions and theorems covered. The following is a list of skills you will likely need to be able to apply on the exam. This list is meant to be a guide and is not exhaustive. In particular, you should be able to:

- Approximate the volume of a solid using a double Riemann sum.

- Interpret a double integral as the volume of a solid.

- Use Fubini's theorem to interpret a double integral as an iterated integral.

- Compute double integrals over rectangles.

- Compute double integrals over more general regions, interpreting the region as vertically simple or horizontally simple, or using polar coordinates.

- Use Fubini's theorem to change the order of integration.

- Use a double integral to find the area of a region in the plane.

- Compute triple integrals over rectangular prisms and more general regions in space.

- Use a triple integral to find the volume of a solid.

- Find the average value of a multivariable function.

- Evaluate and interpret triple integrals using cylindrical coordinates.

- Evaluate and interpret triple integrals using spherical coordinates.

- Find the centroid of a region in the plane or a solid in space.

- Compute the mass and center of mass of a lamina with variable density.

- Use triple integrals to find the mass and center of mass of a solid with variable density.

- Calculate probabilities for continuous random variables using probability density functions and joint probability density functions.

- Evaluate double and triple integrals using a change of variables and the appropriate Jacobian.

- Match a vector field to a plot.

- Compute and interpret curl and divergence of a vector field.

- Determine if a two-dimensional vector field is conservative.

- Determine if a three-dimensional vector field is conservative.

- Find a potential function for a conservative vector field.

- Compute a line integral of a function along a curve with respect to arc length.

- Compute a line integral of a vector field along a curve.

- Compute and interpret work done by a force field.

- Compute flux across a plane curve.

- Compute the total mass or charge of a wire with a given density or charge density function.

- Apply the fundamental theorem of line integrals to compute line integrals of conservative vector fields.

- Parameterize a surface and identify the grid curves.

- Find the tangent plane to a parametric surface at a point.

- Compute surface area of a parametric surface.

- Evaluate surface integrals of functions and vector fields.

- Find the mass and center of mass of a thin plate in the shape of a surface with variable density.

- Compute flux across a surface.

- Apply Green's Theorem to calculate a line integral or a double integral.

- Use Green's Theorem to compute area of a region in the plane.

- Apply vector forms of Green's Theorem.

- Apply Stokes' Theorem to compute a surface integral or path integral.

- Apply the Divergence Theorem to compute a surface integral or triple integral.