Exam #5 objectives

For Exam #5, a well-prepared student should be able to

- articulate a fundamental meaning for each type of integral we have studied
- set up a definite integral equal to a line integral for a given function (i.e., scalar field) and a given curve in the plane or in space
- construct and evaluate an integral to compute the length of a given curve
- construct and evaluate an integral to compute the total for some quantity given a curve and a length density along that curve
- state a geometric definition of cross product
- compute a cross product given the components of two vectors
- compute area of a parallelogram or of a triangle given the coordinates of vertices
- determine (by either computation or geometric argument) an expression for an infinitesimal area element given a surface in space
- set up an iterated integral (in two variables) equal to a surface integral for a given function (i.e., scalar field) and a given surface in space
- construct and evaluate an integral to compute the area of a given surface
- construct and evaluate an integral to compute the total for some quantity given a surface and an area density along that surface
- sketch or describe a vector field plot for a given vector field in the plane or in space
- set up a definite integral equal to a line integral for a given vector field and a given curve in the plane or in space
- interpret a line integral for a vector field in terms of either work or fluid flow
- use the component test to determine whether or not a given vector field is conservative (that is, has a potential function) for a given region
- find a potential function for a given conservative vector field
- use the Fundamental Theorem of Line Integrals to evaluate a given line integral for a vector field
- understand and articulate the connection between a vector field having a potential function and path-independence of line integrals for that vector field