

### Math 223 Exam 3 Topics

Note: Be sure you can parameterize simple curves (line segments, circles, graphs of functions).

1. Evaluate a triple integral in spherical coordinates, given a geometric description of the region of integration. See Section 12.7. For practice, do problems 19–27.
2. Evaluate the line integral of a scalar field  $f : \mathbb{R}^2 \rightarrow \mathbb{R}$ . See Section 13.2 and Formula 3, page 732. This line integral can be used to compute the length, mass, and center of mass of a wire. For practice, do problems 1–10.
3. Evaluate the line integral of a vector field  $F : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ . See Section 13.2 and Formula 13, page 738. This line integral can be used to compute the work done by the vector field along a curve. For practice, do problems 26–28 and 35–37.
4. Decide if a vector field  $F : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  is conservative or not. If so, find a scalar field  $f : \mathbb{R} \rightarrow \mathbb{R}$  such that  $F = \nabla f$  and use it to evaluate the line integral of  $F$  over a path. See Section 13.3 and Theorem 2, page 742. Practice by doing problems 3–18.
5. Use Green's Theorem to evaluate the line integral of a vector field  $F : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  about a simple closed positively oriented curve. The problem may be an applied one, in which you use Green's Theorem to calculate an area. See Section 13.4. For practice, do problems 1–20.