CHAPTER 12 (12.6, 12.8, 12.9)

- Surface area
  - Approximate surface by areas of small patches (tangent planes)
  - Sum all patches and take limit to get surface area
  - Surfaces are typically parametrized in u,v or x,y
- Solve triple integrals in rectangular, cylindrical, and spherical coordinates
- Change of variables for double (and triple) integrals
  - Given a change of variables
  - Choose a suitable change of variables
  - Need to calculate Jacobian

CHAPTER 13 (13.1-13.8)

- Vector field: a function that assigns a vector to every point
  - Examples: velocity field of fluid
- Gradient vector field
- **Conservative vector field
  - A vector field **F** is conservative if it is the gradient of a scalar function f (f is called the potential function of **F**).
- Line Integrals
  - Parametrize in terms of t, x, or y
  - Calculate line integral of scalar function f
  - Calculate line integral of vector function **F**
    - p.920 defn 3
- Fundamental Theorem of line integrals
  - Line integral of a conservative vector field (gradient vector field of potential function) can be evaluated by knowing the value of f at the endpoints of C
  - Test for conservative function
  - Find the potential function
- Green's Theorem
  - Relates line integral around a simple closed curve with a double integral over the plane region bounded by the curve
  - Curve must be oriented positively (counterclockwise)
  - Formulas for area using line integrals
- Definitions of curl and divergence
- Vector forms of Green's theorem
- Surface integrals
  - Of scalar functions, f
  - Of vector functions, **F**
  - Surfaces are parametrized typically in u,v or x,y
  - Note definitions of **n** and dS
  - Interpreted as flux across a surface
- Stokes' Theorem
  - Relates surface integral of curl **F** over a surface S to a line integral around the boundary curve of S (which is a space curve)
- Divergence Theorem
  - Relates flux integral (flux of **F** across boundary surface of E) to a triple integral of the divergence of **F** over E