

## Topics and Book Review for Final Exam

### Chp 1: Vectors and Matrices

- vector arithmetic, dot and cross products
- 1.4 Exercises: #26
- equations of lines and planes
- 1.2 Exercises: #15–18; 1.5 Exercises: #16–19
- matrix arithmetic, the determinant
- Cartesian, polar, cylindrical and spherical coordinates
- 1.7 Exercises: #23–25; 26–35 except instead of sketching, translate these inequalities as though they were bounds of integration.
- 1.8 True/False: all but #11
- 1.9 Misc. Exercises: #8, 9, 38, 39

### Chp 2: Multivariate Functions and Derivatives

- graphs of multivariate functions
- 2.1 Exercises: #36–42; also parametrize these surfaces in terms of two variables (which need not be  $x$ ,  $y$ , or  $z$ )
- partial derivatives, the gradient, and tangent planes
- 2.7 True/False: #1–9, 15–22, 24–28

### 3.1-2: Parametrized Curves

- parametrization in one variable, velocity, acceleration, speed
- the arclength parameter
- 3.2 Exercises: #1–6

### 3.3-4: Vector Fields and Related Operations

- vector fields, gradient fields
- 3.3 Exercises: #23(a), 24(a)
- divergence, curl, del; relationship to gradient
- 3.4 Exercises: #1–11, 14
- 3.6 Misc. Exercises: #43

### 3.5: True/False: #4, 5, 14–26, 28–30

### 5.2-4: Double and Triple Integrals

- setting up and evaluating
- 5.2 Exercises: #11–16, 21–23; 5.4 Exercises #11–18
- changing order of integration (via Fubini or more complicated)
- 5.3 Exercises: #14–18; 5.4 Exercises #21–25

### 5.5: Change of Variables

- Jacobian for the three standard systems
- recognizing integrals where different coordinates would be useful
- applying a standard coordinate transformation to evaluate an integral
- 5.5 Exercises #13–17, 25–27

### 5.6: Applications; Exercises #2–4, 6, 7

**5.7:** True/False: #1–8, 12–18, 22–26

**6.1:** Line Integrals

- scalar line integrals
- vector line integrals (work)
- orientation's effect on each
- Exercises: #6–9, 17–21 (use Green or Stokes if appropriate)

**6.2:** Green's Theorem

- original form, curl form (circulation)
- Exercises: #1, 2, 14, 17, 19

**6.3:** Conservative Vector Fields

- path independence
- 0 integral on closed curves
- conservative vector field, potential function
- using potential functions to evaluate line integrals
- curl criterion for conservativity
- partial integration
- Exercises: #6–11, 19, 20, 23

**6.4:** True/False: #1–7, 10, 11, 15, 16, 19–21, 23–26

**7.1:** Parametrized Surfaces

- parametrization given a description of a surface
- normal vector and tangent plane to a parametrized surface
- surface area
- Exercises: #1, 3, 6, 11, 18–23

**7.2:** Surface Integrals

- scalar surface integrals
- vector surface integrals (flux)
- orientation and its effect on each
- Exercises: #1–3, 12–15, 19, 20 (use Gauss if appropriate)

**7.3:** Stokes' and Gauss's Theorems

- Stokes' theorem: from surface to boundary and vice-versa, from surface to nicer surface via common boundary
- Gauss's theorem (divergence theorem)
- Exercises: #1–9, 12, 16

**7.5:** True/False: #1–20, 22–24

**Omitted Topics**

Chapter 1: projections; intersections and distances for lines and planes

Chapter 2: multivariate limits; directional derivatives; the chain rule

Chapter 3: non-arclength parts of 3.2; flow lines

Chapter 5: general transformations and Jacobians; moments, center of mass

Chapter 6: divergence form of Green's Theorem