

## Information pertaining to the Final Exam

The final exam is cumulative. Roughly speaking, half of the test will be on old material and half will be on new material. For the old material, the best first step is to review the old tests, solutions to which are available online. *You should understand and know how to work all of these old problems.* For further study, you could look over the review problems listed in the reviews for each of the previous tests. The new material is basically Stokes' Theorem and the Divergence Theorem. Because these theorems involve line and surface integrals along with double and triple integrals, I recommend reviewing those techniques.

When faced with an integral, these are the steps:

(i) Figure out how to approach the problem. Are you going to evaluate the integral directly, or are you going to use a theorem to turn it into something else to solve? This involves, among other things, knowing what the theorems actually say. See the how-to handout for help on this step.

(ii) If need be, find a parametrization.

(iii) Plug in to the formula and compute.

Most major mistakes occur in step one. **READ AND UNDERSTAND THE HANDOUT!** Step two usually comes down to remembering how to turn a function into a parametrization. Step three is just a matter of remembering the formula correctly and not making careless errors.

The eight basic themes for the final are the following:

- the chain rule
- max/min
- gradients and contour diagrams
- double/triple integrals, including polar, cylindrical, and spherical coordinates
- fundamental theorem for line integrals and conservative vector fields
- state and use Green's theorem
- state and use Stokes' theorem
- state and use the divergence theorem

I will give you the spherical and cylindrical equations  $x = \rho \cos \theta \sin \phi$ , etc. You will need to remember the "scaling factors"  $\rho^2 \sin \phi$ , and  $r$ .

You should expect some problems that test your understanding of concepts and involve little or no calculation. Examples of such include the true-false review problems, questions like "which of the following must be zero and why" and §17.5 #12.

### **Chapter 17 review, pages 1171-1173:**

Concept Check: 2, 3ab, 4ab, 5-11, 12ab, 13abc, 14-16

True/False: 1-8

Exercises: 29, 31-35, 39

**Answers to even exercises:** #32:  $-4\pi$  (half-angle formulas involved); #34:  $11\pi$