Review Sheet for Exam 2

Standard disclaimer: The following represents a sincere effort to help you prepare for our exam. It is not guaranteed to be perfect. There might well be minor errors or (especially) omissions. These will not, however, absolve you of the responsibility to be fully prepared for the exam. If you suspect a problem with this review sheet, please bring it to my attention (bounty points are possible).

Review: I will use my office hours on Wed April 8 and the tutorial on Thursday April 9 to answer questions about the exam.

Time and place: the exam will take place Friday April 10 in class. It will cover change of variables in integrals (Shifrin 7.3, 7.6, Jones 10FG), arc-length and path integrals over curves (Shifrin 8.4, Jones 11A, Jones 12), cross products (Shifrin 1.5) and surface area (my lectures).

Ground Rules: the exam is closed book and no calculators are allowed. All you'll need are sharp pencils and a good eraser. No pens please!

Format: Similar to fall exams. Not much true/false stuff this time.

Specific topics:

Definitions and statements: *Change of Variables Theorem*; *covector*; *arc-length integral* of a continuous function over a smooth curve; *differential* 1*-form*; *path integral* of a continuous 1-form over a smooth parametrized curve; *differential* of a smooth function; *closed*/*exact* 1-form; *pullback* of a 1-form by a differentiable map; *Green's Theorem*; *smooth parametrized surface* and its *surface area*.

True/false knowledge: Be able to give an example (with proof) of a smooth closed 1-form that is not exact.

Computational/proof skills: Applying the change of variables theorem to compute integrals, particularly in the special cases of polar, cylindrical and spherical coordinates. Integrating a function with respect to arc-length along a curve. Know how to prove that reparametrization doesn't affect arc-length integrals. Integrating a one form along a curve. Recognizing exact one forms and finding potentials for them. Using potentials to compute line integrals. Using Green's Theorem to compute line integrals and integrals over regions in $\mathbf{R}^2$. Understand the proof of Green's Theorem. Computing/manipulating cross-products. Computing the area of a parametrized surface in $\mathbf{R}^3$.