Math 2934 (Honors) — Fall 2015
Review for third exam

The third exam will be on the material in sections 15.3, 15.4, 15.6, 15.7, 15.8, 15.9, 16.1, 16.2, 16.3, and 16.4. The relevant assignments and quizzes are assignments 8, 9, 10, 11, 12, and quizzes 5 and 6.

15.3. This section was already covered on the second exam, but you should review especially what happens to the limits of integration when you change the order of the integrals in a double integral, as in example 5 on page 1017.

15.4. Double integrals in polar coordinates. Review the entire section.

15.6. Surface area. Review the entire section.

15.7. Triple integrals. Review the entire section, except you can stop at equation 15 on page 1047 (you don't need to know about moments of inertia, electric charge, or joint density functions).

15.8. Triple integrals in cylindrical coordinates. Review the entire section. You should know figure 2 and the associated equations 1 and 2 on page 1052, given the relations between polar and rectangular coordinates. Figure 7 is also worth remembering, because it explains why the volume element dV in a triple integral becomes $r\ dr\ d\theta\ dz$ in cylindrical coordinates.

15.9. Triple integrals in spherical coordinates. Review the entire section. As for cylindrical coordinates, you should know Figure 5 and the accompanying formulas 1 and 2 relating rectangular to spherical coordinates. Another useful formula is $r = \rho \sin\theta$, relating the cylindrical coordinate r to the spherical coordinate ρ. Also, Figure 7 on p. 1058 is worth remembering because it explains why the volume element dV becomes $\rho \sin\phi\ d\rho\ d\phi\ d\theta$ in spherical coordinates.

16.1. Vector fields. All you need to read from this section are the first few paragraphs on page 1081, which explain what a vector field is, and the subsection on pages 1084 – 1085 titled "Gradient Fields".

16.2. Line integrals. The entire section is worth reading, but if you want to only read the minimum, you can start with the box numbered 7 on page 1090, and read from there to the end of the section. In this class we don't ever actually have to compute line integrals of the type $\int f(x,y,z)\ ds$, as defined in box 9 on page 1092. However, you should still know how these are defined, so you can follow along with the explanations in the book. That is, you should know that ds in this integral refers to $\sqrt{(dx/dt)^2 + (dy/dt)^2 + (dz/dt)^2}\ dt$. If you know that, then you will see why the line integral $\int_C \mathbf{F}\cdot d\mathbf{r}$ in the definition 13 on page 1095 can also be written as $\int_C \mathbf{F}\cdot\mathbf{T}\ ds$ (recall that $\mathbf{T} = \mathbf{r}'(t)/|\mathbf{r}'(t)|$, and $|\mathbf{r}'(t)|\ dt = ds$). In doing practice problems from the homework at the end of the section, you can skip any problem that asks you to find an integral of type $\int_c \ldots\ ds$.

16.3. The fundamental theorem for line integrals. Review from the beginning of the section through Example 5. You can skip the last section titled "Conservation of Energy".

16.4. Green's Theorem You should memorize the formula in the statement of Green's Theorem (box on page 1108). Read examples 1 and 2 on page 1110. You can skip the remainder of this section. But you should be able to problems like exercises 1 to 10 at the end of this section.