Exam 3 Take-home Portion Calc 3 Due 12/4/2012

Each problem is worth 10 points. For full credit provide complete justification for your answers. You are honor-bound to spend no more than 1 hour working on this exam, and to use no external resources (other people, books, or online sources) while working on it.

8. Let $\mathbf{G}(x, y, z) = \langle 2y, -1, x \rangle$. Directly evaluate (i.e., without Stokes') $\iint_S \operatorname{curl} \mathbf{G} \cdot \mathbf{n}\, dS$, where S is the cylinder with radius 2 centered on the z-axis between the xy-plane and $z = 3$, with outward orientation.

9. Let $\mathbf{G}(x, y, z) = \langle 2y, -1, x \rangle$. Use Stokes' Theorem to evaluate $\iint_S \operatorname{curl} \mathbf{G} \cdot \mathbf{n}\, dS$, where S is the cylinder with radius 2 centered on the z-axis between the xy-plane and $z = 3$, with outward orientation. [Hint: $\int \sin^2 x\, dx = \frac{x}{2} - \frac{\sin 2x}{4} + C$.]

10. Let $\mathbf{F}(x,y,z) = \left\langle \dfrac{x}{\sqrt{x^2+y^2+z^2}}, \dfrac{y}{\sqrt{x^2+y^2+z^2}}, \dfrac{z}{\sqrt{x^2+y^2+z^2}} \right\rangle$. Use the divergence theorem to evaluate $\iint_S \mathbf{F} \cdot \mathbf{n}\, dS$, where S is a sphere with radius R centered at the origin and outward orientation.