WRITTEN HOMEWORK #9, DUE 3/7/2012 AT 4PM

You may turn this assignment at the homework boxes on the bottom floor of Kemeny or at the beginning of class on Wednesday. Because this week's assignment is due close to the date of the final, no late assignments will be accepted. Graded homework will be available for pickup on Thursday late afternoon. Please staple your assignment before turning it in. Remember that you need to provide correct and reasonably complete details to receive full credit. The problems are taken from the 7th edition of Stewart's *Calculus*, although occasionally a problem will be modified to be slightly different from its textbook counterpart.

(1) (Chapter 16.9, Problem #18) Let $\mathbf{F} = \langle z\tan^{-1}(y^2), z^3\ln(x^2+1), z\rangle$. Find the flux of $\mathbf{F}$ across the part of the paraboloid $x^2+y^2+z=2$ that lies above the plane $z=1$ and is oriented upwards.

(2) (Chapter 16.9, Problem #24) Use the Divergence Theorem to evaluate

$$\iint_S (2x+2y+z^2)\,dS,$$

where S is the sphere $x^2+y^2+z^2=1$.

(3) (Chapter 16.8, Problem #17) A particle moves along line segments from the origin to the points $(1,0,0), (1,2,1), (0,2,1)$, and then back to the origin under the influence of the force field $\mathbf{F} = \langle z^2, 2xy, 4y^2\rangle$. Find the work done in two separate ways: (a) by directly calculating this line integral, and (b) by using Stokes' Theorem with a suitable choice of surface S.

(4) (Chapter 16.8, Problem #18) Evaluate $\int_C (y+\sin x)\,dx+(z^2+\cos y)\,dy+x^3\,dz$, where C is the curve $\mathbf{r}(t) = \langle \sin t, \cos t, \sin 2t\rangle, 0 \le t \le 2\pi$. (Hint: Observe that C lies on the surface $z=2xy$.)