Math 103.01 Summer 2001
Assignment #5
Due: Friday, June 22, 2001

You must work through all problems on your own. You may consult any reference materials but do not discuss these problems with anyone else in the class. Show all work neatly and in order, and clearly indicate your final answers. Answers must be justified whenever possible in order to earn full credit.

1. Suppose $\mathbf{F}(x,y,z) = (y^2z^3, 2xyz^3, 3xy^2z^2) = y^2z^3\mathbf{i} + 2xyz^3\mathbf{j} + 3xy^2z^2\mathbf{k}$.

a. Compute div $\mathbf{F} = \nabla \cdot \mathbf{F}$.

b. Compute curl $\mathbf{F} = \nabla \times \mathbf{F}$.

Let C be the boundary curve of the rectangle with vertices at $(0,0)$, $(1,0)$, $(1,1)$ and $(0,1)$.

c. Compute $\oint_C \mathbf{F} \cdot d\mathbf{r} = \oint_C \mathbf{F} \cdot \mathbf{T}\, ds$.

2. Let $\mathbf{F}(x,y) = (x^2 - y^2)\mathbf{i} + 2xy\mathbf{j}$. Use Green's theorem to evaluate $\oint_C \mathbf{F} \cdot \mathbf{T}\, ds$ where C is the positively oriented curve given by the line segments from $(0,0)$ to $(1,0)$ and from $(1,0)$ to $(1,1)$ and the parabolic curve $y = x^2$ from $(1,1)$ to $(0,0)$.

3.
- **a.** Edwards and Penney Page 974 #2
- **b.** Edwards and Penney Page 974 #6
- **c.** Edwards and Penney Page 975 #13

4.
- **a.** Edwards and Penney Page 982 #4
- **b.** Edwards and Penney Page 982 #11
- **c.** Edwards and Penney Page 983 #34

5.
- **a.** Any **two** of Edwards and Penney Page 991 #1 - #12
- **b.** Edwards and Penney Page 991 #13
- **c.** Edwards and Penney Page 991 #18