Math. 302-01
Spring, 2005
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Sixth Examination
Friday, April 15, 2005

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. You may keep this exam sheet. Each problem is worth 25 points.

1. Write down a parametrization of the line through $(1, 1, 1)$ and $(2, 3, 4)$.

2. Write down a parametrization of the plane through $(1, 0, 0)$, $(0, 1, 0)$, and $(0, 0, 1)$.

3. Suppose
$$\vec{F}(x, y) = \begin{bmatrix} y \\ -x \end{bmatrix}, \tag{1}$$
and suppose $\mathcal{C}$ is the curve $y = x^2$, $0 \le x \le 1$. Then compute the line integral
$$\int_{\mathcal{C}} \vec{F} \cdot d\vec{r}.$$

4. Is the vector field in Equation 1 conservative? State why or why not. If it is conservative, then write down a potential function.