Math 2374

Spring 2010

Midterm 2

March 25, 2010

Time Limit: 50 minutes

Name (Print): _____

Student ID: _____

Section Number: _____

Teaching Assistant: _____

Signature: _____

This exam contains 7 pages (including this cover page) and 6 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated. You are allowed to take one-half of one (doubled-sided) 8.5 inch × 11 inch sheet of notes into the exam.

Do not give numerical approximations to quantities such as $\sin 5$, π, or $\sqrt{2}$. However, you should simplify $\cos \frac{\pi}{4} = \sqrt{2}/2$, $e^0 = 1$, and so on.

The following rules apply:

- **Show your work**, in a reasonably neat and coherent way, in the space provided. **All answers must be justified by valid mathematical reasoning, including the evaluation of definite and indefinite integrals**. To receive full credit on a problem, you must show enough work so that your solution can be followed by someone without a calculator.

- **Mysterious or unsupported answers will not receive full credit**. Your work should be mathematically correct and carefully and legibly written.

- **A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit**; an incorrect answer supported by substantially correct calculations and explanations will receive partial credit.

- Full credit will be given only for work that is presented neatly and logically; work scattered all over the page without a clear ordering will receive from little to no credit.

1	25 pts	
2	25 pts	
3	20 pts	
4	25 pts	
5	20 pts	
6	25 pts	
TOTAL	140 pts	

1. (25 points) Let $\vec{F} = 2xz^2\vec{i} + \vec{j} + y^3zx\vec{k}$ and $f = (z+1)^5$. Compute $\mathrm{div}(f\,\mathrm{curl}\,\vec{F})$.

2. (25 points) Compute the work done in moving a particle of mass m along the path $\vec{c}(t) = (t^2, \sin t, \cos t)$ from $t = 0$ to $t = 1$.

3. (20 points) Find the mass of a wire formed by the graph of function $y = x^2 + 1$ in the plane with $1 \le x \le 4$, if the density at point (x, y) is given by $\rho(x, y) = x$ grams per unit length of wire.

4. (25 points) Evaluate

$$\int_0^1 \int_x^{\sqrt{x}} e^{x/y}\, dy\, dx.$$

5. (20 points) Evaluate the triple integral

$$\int\int\int_W z\,dxdydz,$$

where W is the region bounded by the planes $x = 0$, $y = 0$, $z = 0$, $z = 1$, and the cylinder $x^2 + y^2 = 1$, with $x \geq 0$, $y \geq 0$.

6. (25 points) Evaluate

$$\int_C xy\,dx + x^2\,dy$$

where C is the boundary of the triangle with vertices $(0,0)$, $(2,0)$, $(1,1)$, oriented in the counterclockwise direction.