Math 20E
Midterm Exam 2
November 22, 2013
· · ·
Version A

Instructions

1. You may use any type of calculator, but no other electronic devices during this exam.

2. You may use one page of notes, but no books or other assistance during this exam.

3. Write your *Name*, *PID*, and *Section* on the front of your Blue Book.

4. Write the *Version* of your exam on the front of your Blue Book.

5. Write your solutions clearly in your Blue Book

    (a) Carefully indicate the number and letter of each question and question part.

    (b) Present your answers in the same order they appear in the exam.

    (c) Start each question on a new side of a page.

6. Read each question carefully, and answer each question completely.

7. Show all of your work; no credit will be given for unsupported answers.

0. (1 point) Carefully read and complete the instructions at the top of this exam sheet and any additional instructions written on the chalkboard during the exam.

1. (6 points) Find the area of the portion of the plane defined by $3x + 4y + z = 8$ that lies within the cylinder $x^2 + y^2 = 4$.

2. (6 points) A surface S is given by $z = 4 - x^2 - y^2$, with $z \geq 0$. The mass density of S is $\rho(x, y, z) = \sqrt{4x^2 + 4y^2 + 1}$ grams per unit area. Find the total mass of S.

3. (6 points) Evaluate $\iint_S \mathbf{F} \cdot d\mathbf{S}$, where $\mathbf{F}(x, y, z) = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ and S is the surface given by $z = x^2 - y^2$ with $-2 \leq x, y \leq 2$, that is, $(x, y) \in [-2, 2] \times [-2, 2]$.

4. (6 points) The equation $25x^2 + 4y^2 = 100$ defines an ellipse. It is parametrized by

$$x(t) = 2\cos(t), \quad y(t) = 5\sin(t), \quad \text{with } 0 \leq t \leq 2\pi.$$

Find the area of the ellipse by evaluating an appropriate line integral.