Math 20E
Midterm Exam 1
February 3, 2012
...
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.

1. Consider the function

$$\mathbf{f} : \mathbb{R}^2 \longrightarrow \mathbb{R}^3$$
$$\mathbf{f}(x, y) = \left(x^2 - y^2, 2xy, e^{2x+y} \right)$$

   Find $\mathbf{Df}\left(\frac{1}{2}, -1 \right)$.

2. Given $f(x, y) = e^{2x+5y}$. Find the 2nd-order Taylor polynomial for f at $(0, 0)$.

3. Evaluate the iterated integral

$$\int_{y=0}^{3} \int_{x=\frac{1}{3}y}^{1} \sin\left(x^2 \right) \, dx \, dy$$

   by changing the order of integration. Be sure to clearly sketch the region of integration and indicate how you found the new limits of integration.

4. Let D be the region bounded by the lines

$$x + y = 0, \quad x + y = 2, \quad x - y = 0, \quad x - y = 2.$$

   Evaluate

$$\iint_D (x + y) e^{x^2 - y^2} \, dx \, dy$$

   using the change of variables $u = x + y, \quad v = x - y$.