Vector Calculus Midterm Information & Update

The first midterm exam in vector calculus (110.202) this term is scheduled for Wednesday March 3, from 10:00 - 11:00 AM, in

Olin 305, if you are **registered** in an **even**-numbered section, and in

Bloomberg 272 (our usual lecture room) if you are **registered** in an **odd**-numbered section.

[It doesn't matter which section you are actually attending.]

• As stated in the course syllabus, there will be no makeups: the grade for an excused absence will be the average of your grade on later tests.

• Students requiring special accomodation for the exam should please send

`jack@math.jhu.edu`

a note about this **immediately**.

• All you will need for the exam is a writing instrument and **a xerox of your J-card** or some other serious ID, in a form suitable for stapling to your exam.

• The exam will cover Chapters One and Two of Marsden and Tromba, along with the first two sections of Chapter Four. There will be no material from Chapter Three. The test will follow the format of the attached practice test rather closely, but (since you now have a good idea of what kind of questions to expect), the test questions themselves may be **appreciably harder** than the questions on the practice test!

If you have any questions about any of this, do not hesitate to ask me or the TAs. **Good luck!**

Vector Calculus Practice Exam I

General instructions: There are four problems, equally weighted. Please show any work for which you hope to get credit, because a correct answer is worth **zero (0)** points: it is part of the problem to give a reasonably lucid account of the reasoning behind your answer.

No books or notes are allowed. Calculators are permitted, but no credit will be given for answers stated in terms of decimal numbers. Remember: Cool is the Rool!

1 Calculate the length of the curve $\mathbf{c} : \mathbb{R} \to \mathbb{R}^2$ defined by the function

$$\mathbf{c}(t) = (\cos^3 t, \sin^3 t)$$

as t varies between $t = 0$ and $t = \frac{1}{2}\pi$.

2 The curve $\mathbf{a}(t) = (t, t^2, t^3)$ crosses the plane $4x + 2y + z = 24$ at a single point. Find that point, and then calculate the cosine of the angle between the the tangent vector to $\mathbf{a}$ at that point, and the normal vector to the plane.

3 Calculate the derivative of the function

$$F(t) = f(x(t), y(t), z(t))$$

defined by the path

$$t \mapsto (x, y, z) = (t, t^2, t^3)$$

and the function

$$f(x, y, z) = x^2 y + z \cos x \ ,$$

first **directly**, and then by using the chain rule.

4 Find the points on the surface

$$S = \{(x, y, z) \mid z = g(x, y) = x^2y^2 + y + 1\}$$

where the tangent plane is parallel to the plane

$$-2x - 3y + z = 1 \ .$$