Math 126, Sections D and F, Spring 2012, Midterm II

May 17, 2012

Name_____

TA/Section_____

Instructions.

- There are 4 questions. The exam is out of 40 points.

- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. **Hand in your notes with your exam paper.**

- You may use a calculator which does not graph and which is not programmable. Even if you have a calculator, give me exact answers. ($\frac{2\ln 3}{\pi}$ is exact, 0.7 is an approximation for the same number.)

- **Show your work**. If I cannot read or follow your work, I cannot grade it. You may not get full credit for a right answer if your answer is not justified by your work. If you continue at the back of a page, make a note for me. Please $\boxed{\text{BOX}}$ your final answer.

Question	points
1	
2	
3	
4	
Total	

1. Answer the following about the vector function

$$\mathbf{r}(t) = \langle 5\cos t, 1 + 3\sin t, 4\sin t \rangle.$$

(a) (7 points) Compute the vectors $\mathbf{T}(t)$, $\mathbf{N}(t)$ and $\mathbf{B}(t)$.

(b) (2 points) Find the equation of the oscullating plane to this curve at the point when $t = 7$.
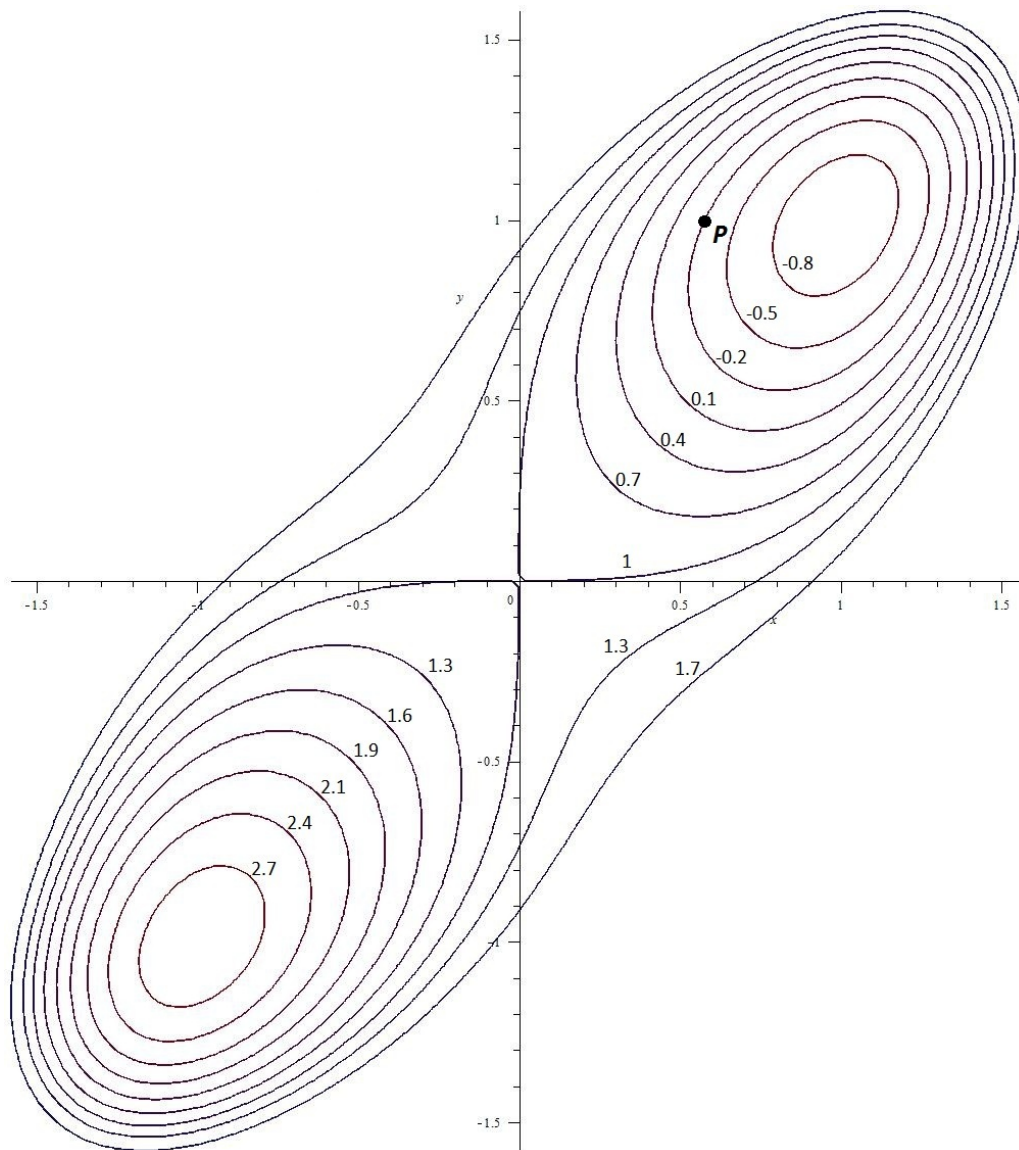
(c) (1 point) This is a circle. Tell me in words how you can find its center.

2. (10 points) Find the minimum and maximum values of the function

$$f(x, y) = 2x^3 - 3x^2 + y^4$$

on the domain $x^2 + y^2 \leq 4$.

3. Answer the questions about $f(x, y)$ whose contour graph is given below.

(a) (5 points) Determine whether the following partial derivatives are positive or negative.

$$f_x(P) \qquad f_y(P) \qquad f_{xx}(P) \qquad f_{yy}(P) \qquad f_{xy}(P)$$

(b) (3 points) Find and classify critical points you can see in this contour graph. Mark them on the picture and give their approximate coordinates.

4. (a) (6 points) Evaluate

$$\int_0^{\pi^2} \int_{\sqrt{x}}^{\pi} \sin\left(\frac{x}{y}\right) dy dx.$$

(b) (6 points) Set up an integral to find the volume of the region bounded by the coordinate planes and the plane $2x + 3y + z = 6$ in the first octant. Evaluate it to find the volume.