Math 126, Section C, Autumn 2012, Midterm II

November 15, 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.
- Look at all the questions before you start. They are equal in point value but not in length.

Question	points
1	
2	
3	
4	
Total	

1. The vector function $\mathbf{r}(t) = \left\langle 4t + 1, \frac{3}{2}t^2 - 7, 0 \right\rangle$ traces a parabola on the xy-plane. Answer the following.

   (a) (2 points) Compute $\mathbf{T}(t)$.

   (b) (3 points) Compute $\mathbf{N}(1)$.

   (c) (1 point) What is $\mathbf{B}(t)$? Think before you compute.

   (d) (2 points) Compute the curvature $\kappa(1)$

   (e) (2 points) The osculating circle of this curve at the point $(5, -11/2, 0)$ (where $t = 1$) lies on the xy-plane. It has radius equal to the reciprocal of the curvature and its radius drawn from its center to the point of tangency is perpendicular to the curve. Find the equation of this oscullating circle. Write it in standard form $(x - a)^2 + (y - b)^2 = r^2$.

2. Given the equation $z^2y + 5zx - xy^3 = 5$

   (a) (4 points) Use implicit differentiation to compute z_x and z_y.

   (b) (3 points) Find the equation of the tangent line to the surface given by this equation at the point $(1, 1, 1)$.

   (c) (3 points) Use linear approximation to approximate the value of c if $(0.95, 1.08, c)$ is on this surface.

3. (10 points) Find the points on the cone given by $z^2 = x^2 + y^2$ that are closest to the point $(4, 2, 0)$. Make sure you verify that your points give minimum distance.

4. (10 points) Evaluate the integral

$$\int_0^1 \int_{5y}^5 e^{x^2} dx \quad dy$$

by reversing the order of integration.