Math 126, Section D - Spring 2014
Midterm II
May 20, 2014

Name: _____

Student ID Number: _____

Section: DA 11:30-12:20 by Hailun ☐ DB 12:30-1:20 by Hailun ☐
DC 11:30-12:20 by Bo Peter ☐ DD 12:30-1:20 by Bo Peter ☐

exercise	**possible**	**score**
1	14	
2	12	
3	12	
4	12	
total	50	

- Check that this booklet has all the exercises indicated above.
- TURN OFF YOUR CELL PHONE.
- Write your name and your student ID.
- This is a 50 minute test.
- You may use a scientific calculator and one 8.5×11 inch sheet of (two-sided) handwritten notes. All other electronic devices (including graphing calculators) are forbidden.
- Unless otherwise indicated, your answers should be exact instead of decimal approximations. For example $\frac{\pi}{4}$ is an exact answer and is preferable to its decimal approximation 0.78.
- Unless otherwise indicated, show your work and justify all your answers. Box your $\boxed{\text{final answer}}$.

Exercise 1 (5+2+2+5=14 points).

Consider the curve $\vec{r}(t) = ((t^2-2)^2, t^4, t^2)$.

a) Compute $\vec{T}(t)$ for general t.

b) Show that the curve lies in the plane $x - y + 4z = 4$.

c) Find one (non-zero) vector that is parallel to $\vec{B}(1)$.

Hint: Think about what *b*) means for the osculating plane and for the position of the vectors $\vec{T}(t), \vec{N}(t), \vec{B}(t)$. You can use those insights to solve *c*) and *d*) with very little calculations.

d) Find one (non-zero) vector that is parallel to $\vec{N}(1)$.

Exercise 2 (8+4=12 points).

Consider the surface in $\mathbb{R}^3$ that is defined by equation $2x^2 + yz + y^3 + xz^2 = 28$.
a) Use implicit differentiation to compute $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.

b) Compute the tangent plane of the surface at $(2, 2, 2)$.

Exercise 3 (12 points).

The equation $z^2 = 2x^2 + xy + y^2$ describes a surface in $\mathbb{R}^3$. Find all points on this surface that are closest to $(x_0, y_0, z_0) = (1, 2, 0)$?
Use the 2nd derivative test to show that the points you found are indeed the closest ones.

Exercise 4 (12 points).

Evaluate the integral

$$\int_0^{1/2} \int_{2y}^{1} y \cdot \cos\left(\frac{\pi}{2} x^3\right)\, dx\, dy$$