Math 126 - Winter 2015
Exam 2
February 3, 2015

Name: ______________________________

Section: ______________________________

Student ID Number: ______________________________

PAGE 1	12	
PAGE 2	14	
PAGE 3	13	
PAGE 4	11	
Total	50	

- There are 4 pages of questions. Make sure your exam contains all these questions.
- You are allowed to use a scientific calculator (**no graphing calculators and no calculators that have calculus capabilities**) and one **hand-written** 8.5 by 11 inch page of notes.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit. **Put a box around your FINAL ANSWER for each problem and cross out any work that you don't want to be graded.** Give exact answers wherever possible.
- If you need more room, use the backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- There may be multiple versions of the exam so if you copy off a neighbor and put down the answers from another version we will know you cheated. Any student found engaging in academic misconduct will receive a score of 0 on this exam. All suspicious behavior will be reported to the student misconduct board. In such an instance, you will be force to meet in front of a board of professors to explain your actions.
  DO NOT CHEAT OR DO ANYTHING THAT LOOKS SUSPICIOUS!
  WE WILL REPORT YOU AND YOU MAY BE EXPELLED!
- You have 50 minutes to complete the exam. Budget your time wisely.
  SPEND NO MORE THAN 10 MINUTES PER PAGE!

GOOD LUCK!

1. A particle is moving in such a way that it's acceleration is given by $\mathbf{a}(t) = \langle 0, e^t, 6\cos(2t)\rangle$. The initial velocity is $\mathbf{v}(0) = \langle 0, 3, 0\rangle$ and the initial position is $\mathbf{r}(0) = \langle 1, 0, 1\rangle$.

   (a) (6 pts) Find the position vector, $\mathbf{r}(t)$.

   (b) (4 pts) Find the normal component of acceleration of $\mathbf{r}(t)$ at $t = 0$.

   (c) (2 pts) For the curve $\mathbf{r}(t)$, the binormal, $\mathbf{B}(t)$, is always parallel to one of the axes. (Circle the correct one).

      i. $\mathbf{B}(t)$ is always parallel to the x-axis.
      ii. $\mathbf{B}(t)$ is always parallel to the y-axis.
      iii. $\mathbf{B}(t)$ is always parallel to the z-axis.

2. (a) Consider the surface defined implicitly by the equation $xz^3 = 8(\sin(xy) + 1)$.

i. (5 pts) Find $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$ at the point $(1, 0, 2)$.

ii. (3 pts) Use the linear approximation at $(1, 0, 2)$, to estimate the z-value on the surface that corresponds to $x = 1.1$ and $y = -0.2$.

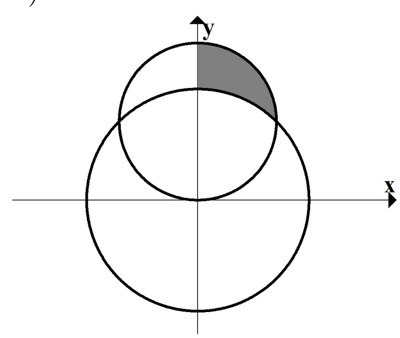
(b) (6 pts) Consider the region of integration for the double integral that looks like:

$$\int_0^3 \int_{(y-1)/2}^1 f(x, y)\, dx dy.$$

Draw the region of integration. And give the equivalent double integral in the reverse order.

3. (a) (6 pts) Find the volume of the solid bounded by the surfaces $y = 2x$, $y = x^2$, $z = 0$, and $z = 6y$.

(b) (7 pts) Using a double integral in polar coordinates, find the area of the region in the first quadrant that is outside of $x^2 + y^2 = 2$ and inside the circle $x^2 + y^2 = 2y$. (You **must** set up and evaluate a double integral in polar coordinates for full credit).



4. Let $z = f(x, y) = x^2 + 4y - x^2y + 1$. Use this function to answer both parts below.

(a) (5 pts) Find and classify all critical points. (Show your use of the 2nd derivative test).

(b) (6 pts) Let R be the region in the xy-plane consisting of all points bounded by $y = 2 - \frac{1}{2}x^2$ and the x-axis. Find the global minimum and maximum of $f(x, y)$ over the region R.