MATH 126 E
Exam II
Autumn 2016

Name _____

Student ID #_____ Section _____

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

SIGNATURE:_____

1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

- Your exam should consist of this cover sheet, followed by 5 problems on 4 pages. Check that you have a complete exam.
- Pace yourself. You have 50 minutes to complete the exam and there are 4 pages. Try not to spend more than about 12 minutes on each page.
- Unless otherwise indicated, show all your work and justify your answers.
- Unless otherwise indicated, your answers should be exact values rather than decimal approximations. (For example, $\frac{\pi}{4}$ is an exact answer and is preferable to its decimal approximation 0.7854.)
- You may use a scientific calculator and one 8.5×11-inch sheet of handwritten notes. All other electronic devices (including graphing and programmable calculators and calculators with calculus functions) are forbidden.
- You are not allowed to use scratch paper. If you need more room, use the back of the page and indicate to the reader that you have done so.
- The use of headphones or earbuds during the exam is not permitted.
- There are multiple versions of the exam, you have signed an honor statement, and cheating is a hassle for everyone involved. DO NOT CHEAT.
- You are not allowed to use your phone for any reason during this exam. Turn your phone off and put it away for the duration of the exam.

GOOD LUCK!

1. (10 points) Dedekind is cutting a pumpkin. The tip of the blade moves according to the formula
$$\mathbf{r}(t) = \langle t, \cos(t), \sin(t) \rangle.$$
Compute the tangential and normal components of acceleration at time $t = \frac{\pi}{4}$.

2. (10 points) Sketch the region D and evaluate the integral
$$\iint_D e^{y^2}\, dA = \int_0^1 \int_x^1 e^{y^2}\, dy\, dx.$$

3. (10 points) Find the equation of the tangent plane to the surface defined by the equation $xy + z^{2016} = 3$ at the point $(1, 2, 1)$.

4. (10 points) Find and classify (as a local max, local min, or saddle point) all critical points of the function

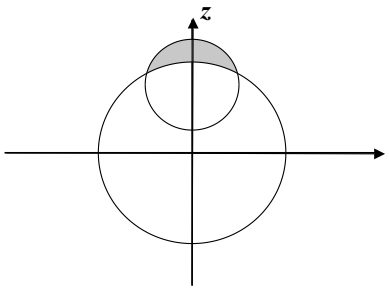
$$f(x, y) = x^3 + y^3 + xy.$$

5. (10 points) The sphere $x^2 + y^2 + z^2 = 1$ intersects the sphere $x^2 + y^2 + \left(z - \frac{3}{4}\right)^2 = \frac{1}{4}$ at the points (x, y, z) such that $x^2 + y^2 = \frac{15}{64}$ and $z = \frac{7}{8}$.

   Compute the volume of the region outside the sphere $x^2 + y^2 + z^2 = 1$ and inside the sphere $x^2 + y^2 + \left(z - \frac{3}{4}\right)^2 = \frac{1}{4}$.

   Some help:

   - Set up a double integral—or the difference of two double integrals—in polar coordinates that represents the volume.
   - The following picture is a SIDE VIEW of a cross-section of the two spheres, NOT the region over which you should integrate.



   - Do not be alarmed if your computations get messy. Continue your work on the back of the page, if necessary. Stay calm, do your best, and plow forward.