MATH 230 CALCULUS III

SPRING 16

<u>PROJECT: THE DESIGN</u> (Due May 5th, 2016) (100 points)

Your task is to design an object that can be modeled by a multivariable function (3D surface). Examples are contemporary buildings, fountains, lamp bases, landscapes, lighting fixtures, roller coasters, rockets, contemporary pieces of furniture, etc…..You will make a power - point report that will include the following items.

1. A **graphical version** of the design using **Mathematica**. Have a name for your design and explain clearly what your object represents and clearly state its dimensions and its multivariable functions. The design may be the union and/or intersection of several surfaces.

2. **Set up the integral** that finds the **volume** of the object enclosed by the designed surface. You may have to find the volume of several parts of the solids and then add them up. **Use Mathematica** to calculate the value of the total volume.

3. **Set up the integral** that finds the **surface area** of the designed object. You may have to find the surface area of several parts of the solids and then add them up. **Use Mathematica** to find the value of the total surface area.

4. **Choose a point** of some significance to your object. At the point, set up the formulas or equations to find the **gradient** and its **magnitude**, the **directional derivative** in some **other direction** that is not the gradient direction. **Use Mathematica** to find those values.

5. **Find the equation** of the **Tangent Plane** and the **Normal Line** at the chosen point and **graph them** on the surface.

6. Include any information or properties that you can determine about the object. Try to include some additional mathematical facts. Be creative. Write as much as you can for this section. Also include a slide about **what you learned working on this project**.

7. You will hand in a **power point presentation** including all the items above as well as your **Mathematica computations**. You will also present your project on May 5th.

8. **Extra Credit**: Build a physical model of your object using the 3D printer in the Engineering department. I will set you up with the person who is in charge of the printer. Mount your object onto some sort of base such as one made out of foam core or clay. Put a title for your object on the base. (Points assigned on quality of model. At most 10% improvement on the project)

Use the timetable below to keep track of your progress. After each stage, make an appointment to meet with me so I can check your work.

Stage of completion	Date
Equation developed (30 points) (find multivariate function that models your surface)	By March 3rd
First five questions answered (50 points)	By April 7th
Extra information collected (5 points)	By April 14th
Report completed (5 points)	By April 29th
Presentation (10 points) **Project due**	**May 5th**

Keep in mind the following criteria while working on your project:

9. **Quality of design**: do you have at least three different surfaces? Is the design well built? Is it creative?
10. **Clarity of presentation**: Is the writing and narration clear?
11. **Correctness of mathematics**: Are the equations developed correct in all aspects? Are the equations matching the graphs?
12. **Was your presentation enjoyable to watch**?

Talk to your instructor if you need help with Mathematica