Multivariable Project:

SINK SURFACE EQUATION :

Water Flow :

The sink will have its top on the xy plane, its sides are a cylinder centered on the origin with a radius of 2 cm. The surface on the bottom and the water flow equation is given below. The sink will have drains and a faucet. You will need to find the following values and objects:

1. (20) Find the volume of the sink.
2. (15) The sink has unit circle drains at every relative minimum or maximum of the function, calculate the volume of water that drains from each drain in the sink. 20
3. (15) If the unit circle faucet is at the origin, calculate that flow rate of water into the sink. 20
4. (15) If the sink was full, calculate how long it would take for the sink to empty with the drains open and faucet on.
5. (20) You would like to place a very small turbine inside the sink that would spin at the maximum angular velocity. If the turbine is to be placed at (1,-2,-3), find the axis that this turbine rotates about and the rate at which it spins.

For f-g assume the particle starts at (1,1,-3) and moves along the surface

In the direction of greatest descent.

1. (15) If a particle was placed directly at the point (1,1,-3) find the path this particle would follow as a parametric equation. Show these parametric equations.
2. (20) Find the **Frenet-Serret** frame for the particle at the point (1,1,-3)



1. (20) Given a density function for the liquid in the sink is calculate the mass of the liquid and the average density.
2. (20) Calculate the pressure the water exerts on each drain.
3. (20) Graph the sink, the water flow, the drains, faucet and the path found it part f.



1. (20) If the vector field was then find the location of a drain in the domain x(-3,3) , y(-3,3) accurate to the nearest cm. that would drain the sink the quickest.