

1. (a) Using Multivariable calculus find volume of a hemisphere of radius a and Create Geogebra/Matlab simulation for visualization. Find the center of mass of the above hemisphere if the density at any point is proportional to its distance from the origin.
- (b)) Create a simulation in Geogebra/ Matlab for visualization of the volume of a cube. Using Multivariable calculus find volume of the cube bounded by the planes $x=-1$, $x=1$, $z=-1$, $z=1$, $y=3$ and $y=5$. Find the mass if density at any point is constant 5.
2. Generate 2 third degree polynomials in x and y that is based on 2 Of your mobile number (suppose if your mobile number is 9412821233, then polynomial will be $9x^3 - 4x^2y + 1xy^2 - 2y^3 + 8x^2 - 2xy + y^2 - 2x + 3y - 3$, use *aletrnative positive and negative sign*). locate all critical points for the function and determine whether they correspond to a maximum, a minimum or a saddle point, by applying a variety of graphical, analytic, and numerical tools. Plot a variety of surface plots with different views (using Geogebra/ Matlab/ some other Package) and contour plots to provide a good picture of the behavior of your function. Label each figure and refer to it in your write-up as you discuss the behavior of the function and the kinds of critical points you apparently observe. (If you have fewer than two critical points, change the signs in your function) Zoom in sufficiently so that you can estimate the coordinates of each of the critical points. Explain your reasoning. Test each of the critical points you find using the Second Derivative Test and report on your findings. Plot the surfaces represented by above polynomials.