

Practice for the redo of Exam1
PHGN361

1. Write an expression for the infinitesimal volume element in spherical and cylindrical coordinates. Integrate this to find the volume of a sphere and cylinder respectively.
2. Write an expression for the infinitesimal area element in spherical and cylindrical coordinates. Integrate this to find the area of a sphere and cylinder respectively.
3. (a) Using the integral form of Gauss's Law, find the electric field due to a sphere of charge. The sphere has radius R and charge density $\rho = A/r$, where A is a constant. Make sure you find the field both inside and outside the sphere. (b) Prove that your result is consistent with the differential form of Gauss's Law.
4. (a) Using the integral form of Gauss's Law, find the electric field due to a infinite cylinder of charge. The cylinder has radius R and charge density $\rho = Ar$, where A is a constant. Make sure you find the field both inside and outside the cylinder. (b) Prove that your result is consistent with the differential form of Gauss's Law.
5. Write a vector from a point on a circle of radius R in the xy plane to an arbitrary point.
6. Write a vector from a point on the surface of a sphere of radius R to an arbitrary point.
7. Write an **INTEGRAL** expression for the electric field at some arbitrary point due to a spherical shell of radius R . The charge distribution is given by $\sigma = \sigma_0 \sin \phi \cos \theta$.