Lesson #9: Potential of a Localized Charge Distribution **Name: ____________________________**

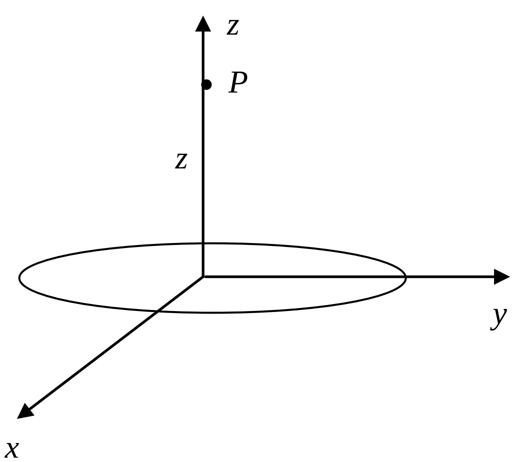
In class we studied one way to find the electric potential of a given charge distribution: by integrating the field along a path. In section 2.3.4 a different method is introduced: summing up the potentials of a collection of point charges (Eq. 2.29). Study this section and take a good look at Example 2.7, then answer the following questions:

1. When we use Eq. 2.29, are we assuming a particular reference point for the potential? If so, what is that point? Explain how you know.

2. In Example 2.7, the potential V is found outside a spherical shell of charge, $V(z) = R^2\sigma/\varepsilon_o z$. Use this result to find the electric field outside the sphere, and explain why the result is what you'd expect.

3. You've solved this problem already for homework using Coulomb's law (problem Q3 on homework set #2). Which approach do you find easier: direct integration of the electric field, or by first calculating the potential? Explain.

4. Apply the techniques of this section to a uniformly charged disk of radius R and charge density σ.In particular, we want to find the electric potential at point P, along the axis of the disk.



   a. On the figure, sketch a representative charge element dq, and the vectors $\vec{r}$, $\vec{r}\,'$, $\vec{\mathscr{r}}$.

   b. How do you write the distance $\mathscr{r}$ using cylindrical coordinates?

   c. Starting from Eq. 2.29, completely specify, but do not evaluate, the integral for finding the potential at point P. Include limits of integration.