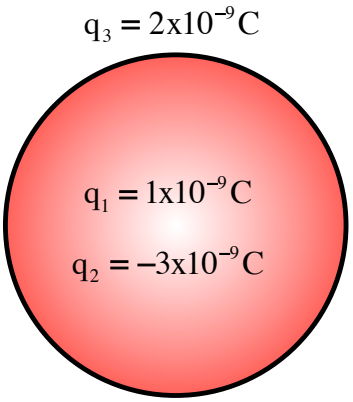
## Problem 24.6

Given there are two charges inside the sphere and a third located above and outside the sphere, what is the net electric flux through the surface?




With "sa" standing for "surface area," the electric flux is equal to:

$$\Phi_E = \int_{sa} \vec{E} \bullet d\vec{A}$$

$$= \frac{q_{enclosed}}{\varepsilon_o}$$

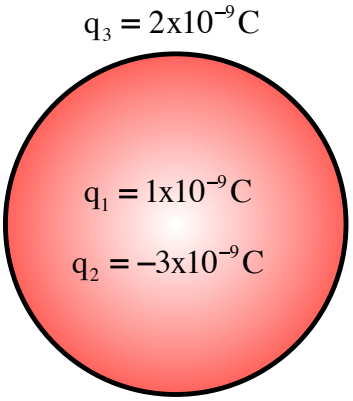
The temptation is to try to determine the net flux by using the integral, but being the clever soul that you are, you realize that all you need to do is determine the *net charge* inside the sphere. That is:



$$\Phi_E = \frac{q_{enclosed}}{\varepsilon_o}$$

$$= \frac{q_1 + q_2}{\varepsilon_o}$$

$$= \frac{(1x10^{-9}C) + (-3x10^{-9}C)}{8.85x10^{-12}C^2 / N \bullet m^2} = -226\ N \bullet m^2 / C$$




where the negative sign signifies that the net electric field is *inward* through the surface.