19.13(a) To calculate the electric field at postion $\vec{r}$ due to charge q we use (19.5) on page 612:

$$\vec{E} = k_e \frac{q}{r^2}\hat{r} \tag{1}$$

Here q should include the sign, and $\hat{r}$ points from the position of q to the position where you want to calculate the electric field. Please read Active Figure 19.10 on page 612 to make sure you understand the direction of $\hat{r}$. Then we use it to compute the vector electric field at origin(x=y=0) due to 6nC and -3nC charges respectively:
For the 6nC charge, q=6NC, r=0.3m, $\hat{r}$=$-\hat{x}$:

$$\vec{E_1} = k_e \frac{6 \times 10^{-9}C}{(0.3m)^2}(-\hat{x}) = -599.3N/C\hat{x}. \tag{2}$$

For the -3nC charge, q=-3NC, r=0.1m, $\hat{r}$=$\hat{y}$:

$$\vec{E_2} = k_e \frac{-3 \times 10^{-9}C}{(0.1m)^2}\hat{y} = -2697.0N/C\hat{y}. \tag{3}$$

Then we sum them up to get the total vector electric field at the origin:

$$\vec{E} = \vec{E_1} + \vec{E_2} = -599.3N/C\hat{x} - 2697.0N/C\hat{y} \tag{4}$$

(b)The vector force on the q=5nC charge at origin is:

$$\vec{F} = \vec{E}q = -3.0 \times 10^{-6}N\hat{x} - 1.3 \times 10^{-5}N\hat{y} \tag{5}$$

19.32(a)We choose a spherical surface of radius r=0.750m given in the problem as the gaussian surface(black circle in Fig.1(a)). We also know that the electric field *everywhere* on the surface is $\vec{E} = 890N/C(-\hat{r})$ pointing radially toward the center of the sphere.

$$\Phi = \oint \vec{E} \cdot d\vec{S} = \oint E(-\hat{r}) \cdot dS\hat{r} = -\oint EdS = -E\oint ds = -E \times 4\pi r^2 = \frac{q_{in}}{\epsilon_0} \tag{6}$$

So we can get the total charge within that sphere:

$$q_{in} = -E \times 4\pi r^2 \epsilon_0 = -890N/C \times 4\pi(0.75m)^2 \times 8.85 \times 10^{-12}C^2/N \cdot m^2 = -5.57 \times 10^{-8}C \tag{7}$$

(b)We can get the total amount of charge within the surface through Gauss's law, but usually we cannot know exactly how charges are distributed within this surface. For this problem, we have an important information that the electric field *everywhere* on the surface is pointing radially toward the center of the sphere with the same amplitude, which indicates that the charge distribution within the sphere must be spherically symmetric. Still there can be many possible cases, for example, there can be a point charge $Q = q_{in}$ in the center of the sphere(Fig.1(a)), or there can be a spherical shell with Q uniformly distributed on its surface(Fig.1(b)), or there can be a ball with Q uniformly distributed in it, or there can be two concentric spherical shells, with charges shown in Fig.1(c). There can be many other cases, but the distribution should follow the constraint that the total charge is Q and it has spherical symmetry.

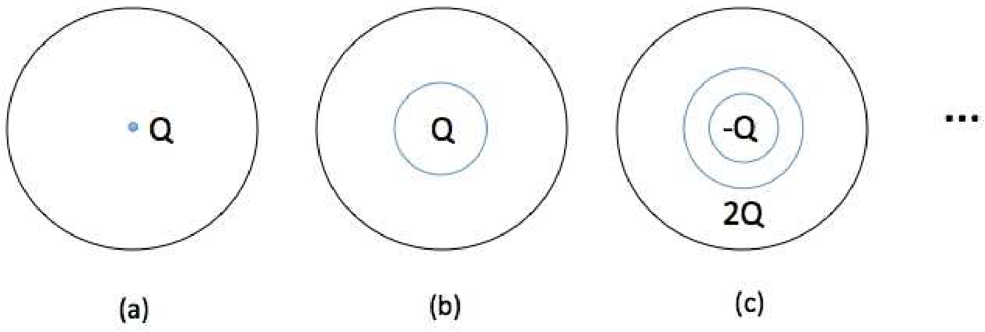

Figure 1: Possible charge distributions