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2.39 & 2.40

a) $\sigma_a = \frac{-q_a}{4\pi a^2}$; $\sigma_b = \frac{-q_a}{4\pi b^2}$; $\sigma_R = \frac{q_a + q_b}{4\pi R^2}$

b) $E = \frac{q_a + q_b}{4\pi\varepsilon_0 r^2}\hat{r}$ for $r \geq R$

c) $E = \frac{q_a}{4\pi\varepsilon_0 r_a^2}\hat{r}_a$ for $r_a \leq a$ where $\vec{r}_a$ is a radius vector originating from the center of cavity a.

$E = \frac{q_b}{4\pi\varepsilon_0 r_b^2}\hat{r}_b$ for $r_b < b$ where $\vec{r}_b$ is a radius vector originating from the center of cavity b

d) $F_a = F_b = 0$. q_a & q_b are held in place by the surface charges σ_a & σ_b respectively.

e) σ_R only would change

2.40 a) Yes. This problem is similar to the force gravity inside a shell: The geometry is such to never cause a net force. Likewise, the geometry of the cavity will cause charge build up commensurate in strength to the charge's proximity