1. **Exercise 22.2.** \( \oint \Phi_E = \int \vec{E} \cdot d\vec{A} = EA \cos \theta \) where \( \theta \) is the angle between the area vector (NOT the angle shown!) and the \( \vec{E} \) field. Integrating \( \Phi_E = EA \cos \theta \) where \( A \) is the rectangle area.

2. **Exercise 22.21.** Apply Gauss' law to \( S_1 \) and \( S_2 \). For RHS, you will have \( Q_{\text{encd}}(a) = \rho \int_a^b 4\pi a^2 dx \) for \( S_1 \) and \( Q_{\text{encd}}(a) \) for \( S_2 \).

3. **Exercise 22.49.** (a) In shell region, use \( Q_{\text{encd}}(a) = \int_a^b \rho(x) 4\pi a^2 dx \).
(b) Arrange for the \( r \)-dependent parts of the new enclosed charge to cancel.

4. **Exercise 22.29.** (a) Use \( Q = \sigma \cdot (2\pi R L) = \sigma \cdot L \) (b) Use Gauss' law for cylindrical symmetry being mindful of the fact that any charge on a conductor appears on its outer surface.

5. **Exercise 22.19.** (a) Add the induced \(-\mathcal{Q}\) that results to preexisting \( \sigma_0 : \sigma' = \sigma_0 - \frac{\Phi}{4\pi b^2} \)
(b) (c) Set up appropriate Gaussian surfaces \( \Sigma \) do the needful.

6. **Problem 22.33.** Use the standard result for \( E = \frac{\sigma}{2\varepsilon_0} \) an insulating infinite sheet electric field. Then \( F_E = q_x E \) where \( q_x \) is the spheres charge. Now just solve the static equilibrium problem: \( \sum F_x = 0 \) and \( \sum F_y = 0 \), eliminating tension through dividing the equations.

7. **Problem 22.55.** (a) Use symmetry (b)(d)
Set up pillbox Gaussian surfaces \( S_1 \) of \( S_2 \). For the enclosed charge, \( Q = \int \rho(x) A \, dx \) where \( A = C\cdot S \cdot \text{area of pillbox}. \)