Reading
Chapter 4, Sections 4.1 – 4.6, pp. 108 – 139.

Problems 1 to 3
Perform the following problems given the following two point-charges:

Point Charge 1: \( Q_1 = 2.4 \text{ mC} \) located at (1,2,-1) meters
Point Charge 2: \( Q_2 = -1.3 \text{ mC} \) located (-1,-1,2) meters

Problem #1
Calculate the electric flux density at (1,0,1) meters.

Problem #2
Calculate the electric field intensity at (-2,0,2) meters.

Problem #3
Calculate the electric force on a 44 nC charge located at (1,3,1) meters.

Problem 4
Calculate the total charge \( Q \) of the nonuniform line charge shown below.

\[
\rho_\ell(y) = (0.3 \text{ C}) (y^2 - y)
\]
Problems 5 to 7

A circular ring of radius $a$ carries a uniform line charge $\rho_L$ (C/m) and is placed in the xy-plane centered about the z-axis. This is illustrated below.

Problem #5

Derive an expression for the electric field $\vec{E}$ at height $h$ above the ring on the z-axis.

Problem #6

Derive an expression for the height $h$ where the electric field $\vec{E}$ is maximum.

Problem #7

If the total charge on the ring is $Q$, derive an expression for the electric field $\vec{E}$ as $a \to 0$. 