Consider a surface charge density of the form

$$\sigma = \sigma_0 \exp \left[ - \left( \frac{x}{a} \right)^2 + \left( \frac{y}{b} \right)^2 \right]$$

where \( \sigma_0, a, \) and \( b \) are constants while \( x \) and \( y \) are cartesian coordinates for the plane.

1. Let \( a = b \). Take the charge to be distributed on a disk of radius \( R_0 \) centered at the origin.
   
   (a) Compute the total charge on the disk.
   
   (b) Compute the force exerted by this distribution of charge on a charge of size \( Q \) at the point \((0, 0, z_0)\).

2. Let \( a = 0.2 \text{ m} \) and \( b = 0.1 \text{ m} \). Take the charge to be distributed on a square of side length \( 0.02 \text{ m} \) centered at the origin.
   
   (a) Compute the total charge on the disk.
   
   (b) Compute the force exerted by this distribution of charge on a charge of size \( 10^{-6} \text{ C} \) at the point \((0, 0, 0.4 \text{ m})\).