Total from area density

1. Charge is distributed on a flat rectangular region of dimensions L by W so that the charge density is proportional to the distance from one corner, reaching a maximum of σ_0 at the far corner. Set up an iterated integral to compute the total charge Q. You do not need to evaluate this integral. As an optional challenge, you can try to evaluate the iterated integral.

   Answer: $Q = \dfrac{\sigma_0}{\sqrt{L^2+W^2}} \displaystyle\int_0^W \int_0^L \sqrt{x^2+y^2}\,dx dy$

2. Charge is distributed on a isosceles triangle of height H and base length B so that the charge density is proportional to the distance from the base, reaching a maximum of σ_0 at the vertex opposite the base. Compute the total charge Q.

   Answer: $Q = \dfrac{1}{6} BH\sigma_0$

3. Charge is distributed on the surface of an open right circular cylinder of radius R and height H so that the area charge density is proportional to the distance from one end of the cylinder, reaching a maximum of σ_0 at the other end. Compute the total charge Q.
   Note: This situation involves an area density. Depending on how you approach the problem, you might end up constructing and evaluating an integral in just one variable.

   Answer: $Q = \pi RH\sigma_0$