

A plastic sheet has a uniform surface charge density  $\sigma$ . An imaginary (Gaussian) cylinder has its left and right end caps equal distances from the sheet, and has a cross-sectional area  $A$ .

Three students make the following statements about the charge enclosed by the cylinder:

Abby: *“The charge enclosed is just  $\sigma$ . Since the sheet is uniform, it doesn’t make any difference how big the imaginary surface is.”*

Barack: *“There is no charge enclosed. The field through the left end cap points to the left and the field through the right end cap points to the right. These fields cancel, and the net electric flux is zero. So the charge enclosed is zero by Gauss’ law.”*

Carlos: *“To find the charge enclosed we would need to know something about the length of the cylinder, which isn’t given.”*

**Which of these students is correct?**

