16.31

a.) What's C? $C = \varepsilon_o \frac{A}{d}$

b.) What's q on each plate? $C = \frac{q}{V_c} \Rightarrow q = CV_c$

c.) What's E? $E \bullet d = -\Delta V$

d.) What's q/A? $\frac{q}{A} = \frac{CV_c}{A} = \frac{\varepsilon_o \frac{A}{d}}{A} = \frac{\varepsilon_o}{d}$

e.) How will they all change is the plates are moved farther apart without disconnecting the voltage source?

e-a.) Looking at the governing equation, if the distance "d" gets bigger, the capacitance will go down.

e-b.) From e-a, if the distance "d" goes up, the capacitance will go down. Looking at the governing equation for "q," if C goes down with V held constant, q goes down.

e-c.) Looking at the governing equation, if d gets bigger with the voltage staying constant, E must go down.

e-d.) Looking at the governing equation, if d gets bigger, $\frac{\varepsilon_o}{d}$ gets smaller.