

1. (a) We note that the electric field points leftward at both points. Using  $\vec{F} = q_0 \vec{E}$ , and orienting our  $x$  axis rightward (so  $\hat{i}$  points right in the figure), we find

$$\vec{F} = (+1.6 \times 10^{-19} \text{ C}) \left( -40 \frac{\text{N}}{\text{C}} \hat{i} \right) = -6.4 \times 10^{-18} \text{ N } \hat{i}$$

which means the magnitude of the force on the proton is  $6.4 \times 10^{-18} \text{ N}$  and its direction ( $-\hat{i}$ ) is leftward.

- (b) As the discussion in §23-2 makes clear, the field strength is proportional to the “crowdedness” of the field lines. It is seen that the lines are twice as crowded at  $A$  than at  $B$ , so we conclude that  $E_A = 2E_B$ . Thus,  $E_B = 20 \text{ N/C}$ .