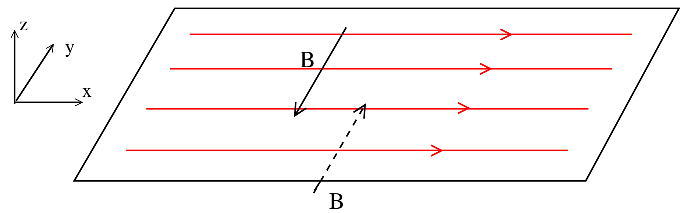
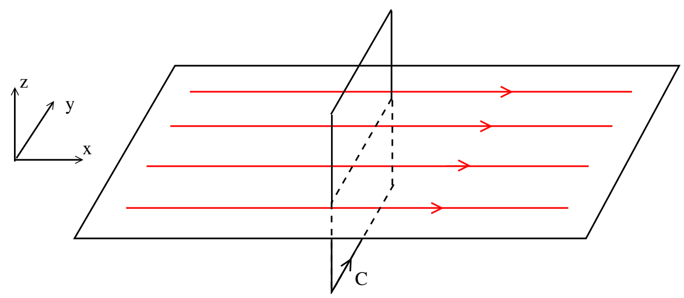
$\mathbf{B}$ is oriented along the $\mathbf{y}$ direction. In fact, from the symmetry of the problem, it must look like



with $\mathbf{B}$ pointing in the $-\hat{\mathbf{y}}$ direction when $z > 0$ and in the $+\hat{\mathbf{y}}$ direction when $z < 0$. We write

$$\mathbf{B} = -B(z)\hat{\mathbf{y}}$$

with $B(z) = -B(-z)$. We invoke Ampère's law using the following open surface:



with length L in the y direction and extending to $\pm z$. We have

$$\oint_C \mathbf{B} \cdot d\mathbf{r} = LB(z) - LB(-z) = 2LB(z) = \mu_0 KL$$

so we find that the magnetic field is constant above an infinite plane of surface current

$$B(z) = \frac{\mu_0 K}{2} \qquad z > 0$$

This is rather similar to the case of the electric field in the presence of an infinite plane of surface charge.

The analogy with electrostatics continues. The magnetic field is not continuous across a plane of surface current. We have

$$B(z \to 0^+) - B(z \to 0^-) = \mu_0 K$$

In fact, this is a general result that holds for any surface current $\mathbf{K}$. We can prove this statement by using the same curve that we used in the Figure above and shrinking it