29. The magnitudes of the forces on the sides of the rectangle which are parallel to the long straight wire (with $i_1 = 30$ A) are computed using Eq. 30-15, but the force on each of the sides lying perpendicular to it (along our y axis, with the origin at the top wire and $+y$ downward) would be figured by integrating as follows:

$$F_{\perp \text{ sides}} = \int_a^{a+b} \frac{i_2 \mu_0 i_1}{2\pi y}\, dy \ .$$

Fortunately, these forces on the two perpendicular sides of length b cancel out. For the remaining two (parallel) sides of length L, we obtain

$$\begin{aligned} F &= \frac{\mu_0 i_1 i_2 L}{2\pi}\left(\frac{1}{a} - \frac{1}{a+d}\right) = \frac{\mu_0 i_1 i_2 b}{2\pi a(a+b)} \\ &= \frac{(4\pi \times 10^{-7}\,\text{T}\cdot\text{m/A})(30\,\text{A})(20\,\text{A})(8.0\,\text{cm})(30 \times 10^{-2}\,\text{m})}{2\pi(1.0\,\text{cm} + 8.0\,\text{cm})} \\ &= 3.2 \times 10^{-3}\ \text{N} \ , \end{aligned}$$

and $\vec{F}$ points toward the wire.