

65. (a) All wires carry parallel currents and attract each other; thus, the “top” wire is pulled downward by the other two:

$$|\vec{F}| = \frac{\mu_0 L(5.0 \text{ A})(3.2 \text{ A})}{2\pi(0.10 \text{ m})} + \frac{\mu_0 L(5.0 \text{ A})(5.0 \text{ A})}{2\pi(0.20 \text{ m})}$$

where $L = 3.0 \text{ m}$. Thus, $|\vec{F}| = 1.7 \times 10^{-4} \text{ N}$.

- (b) Now, the “top” wire is pushed upward by the center wire and pulled downward by the bottom wire:

$$|\vec{F}| = \frac{\mu_0 L(5.0 \text{ A})(3.2 \text{ A})}{2\pi(0.10 \text{ m})} - \frac{\mu_0 L(5.0 \text{ A})(5.0 \text{ A})}{2\pi(0.20 \text{ m})}$$

so that $|\vec{F}| = 2.1 \times 10^{-5} \text{ N}$.