

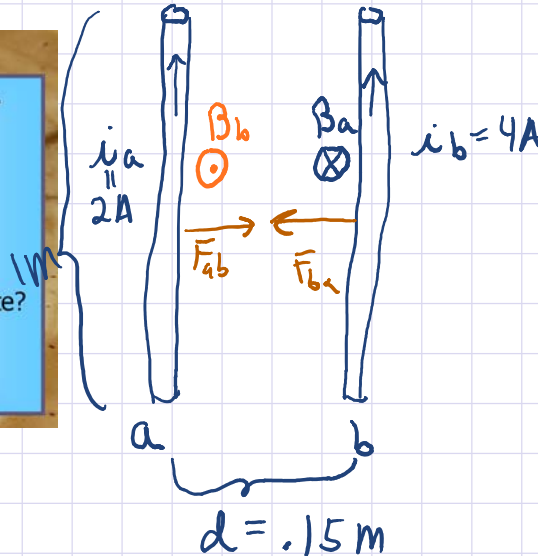
Example 3

Monday, April 21, 2014 7:46 AM

Example 3

3) Two long straight parallel wires are 15 cm apart. Wire A carries 2.0 A. Wire B's current is 4.0 A in the same direction.

- Determine the magnetic field magnitude due to wire A at the position of wire B.
- Determine the magnetic field magnitude due to wire B at the position of wire A.
- Are these two magnetic fields equal and opposite?
- Determine the force on wire A due to wire B.
- Determine the force on wire B due to wire A.
- Are these forces equal?



$$a) B_a = \frac{\mu_0 i_a}{2\pi r}$$

$$B_a = \frac{(4\pi \times 10^{-7} \frac{T \cdot m}{A})(2A)}{2\pi (.15m)}$$

$$B_a = 2.67 \times 10^{-6} T$$

$$b) B_b = \frac{\mu_0 i_b}{2\pi r} = \frac{(4\pi \times 10^{-7} \frac{T \cdot m}{A})(4A)}{2\pi (.15m)} = 5.33 \times 10^{-6} T$$

c) No

$$d) F_{ab} = i_a l B_b \sin \phi$$

$$F_{ab} = (2A)(1m)(5.33 \times 10^{-6} T) = 1.066 \times 10^{-5} N$$

$$e) F_{ba} = i_b l B_a \sin \phi$$

$$F_{ba} = (4A)(1m)(2.67 \times 10^{-6} T) = 1.066 \times 10^{-5} N$$

$$F = \frac{i_a i_b l \mu_0}{2\pi d}$$