



Name: \_\_\_\_\_

Due Date \_\_\_\_\_

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Assignment 5.02: Magnetic Force on Wires

1. The magnetic field due to a long wire carrying current is 0.2 T at a distance of 1 cm from the wire. What would the magnetic field be at a distance of 3 cm from the wire?
  
  
  
  
  
  
  
  
  
  
2. A horizontal power line of length 58 m carries a current of 2200 A toward the north. The earth's magnetic field at this location is  $5 \times 10^{-5}$  T directed toward the north,  $65^\circ$  below horizontal.
  - (a) Find the magnitude of the magnetic force on the power line.
  
  
  
  
  
  
  
  - (b) What is the direction of the force on the power line?
  
  
  
  
  
  
  
  
  
  
3. The average nerve impulse has a current of approximately 16 pA. You are standing in a magnetic field directed to the left. You want to move your small toe, a distance of 1.75 meters from your brain. What strength of magnetic field would cause a barely-noticable force of 0.1 N to be exerted on your nerve?
  
  
  
  
  
  
  
  
  
  
4. A 10-meter long conductor carrying a current of  $I=15$  A is directed along the positive x-axis, perpendicular to a uniform magnetic field. The force on the conductor is 1.2 N in the negative y direction. Determine the magnitude and direction of the magnetic field.



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5. Two horizontal wires carry current to the right. The top wire carries a current of 8A, and the bottom wire carries a current of 2A. How far below the top wire is the magnetic field zero?
6. A wire has a mass of 0.1 kg, and a length of 3 meters, and is carrying a current of 25 amps. It is placed on top of a table, oriented in the X direction, carrying current in the positive X direction. The coefficient of kinetic friction is 0.2. The wire slides horizontally to the north at a constant speed. Calculate the magnitude and direction of the magnetic field needed for this to happen.
7. A current-carrying wire is placed in a magnetic field of 2T. The wire experiences a force of 0.4 N. The length of the wire is 2 meters.
- (a) Calculate the minimum possible amount of current the wire could be carrying.
- (b) Calculate the maximum possible amount of current the wire could be carrying.