

PHYS 1444 – Section 003

Lecture #17

Monday, Oct. 31,
2005

Dr. **Jaehoon Yu**

- Example for Magnetic force between two parallel wires
- Ampère's Law
- Solenoid and Toroid Magnetic Field
- Biot-Savart Law

Today's homework is homework #9, due noon, next Thursday!!



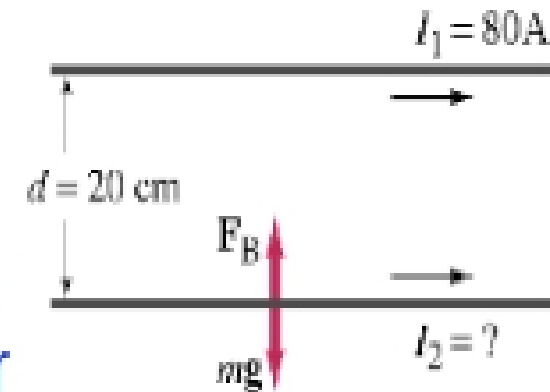
Announcements

- Reading assignments
 - CH28 – 7, 28 – 8, and 28 – 10
- The 2nd term exam
 - Date: Monday, Nov. 7
 - Time: 1 – 2:20pm
 - Location: SH 103
 - Coverage: CH 26 – whichever chapter we get to by Wednesday, Nov. 2
- Your textbooks
 - UTA bookstore agreed to exchange your books with the ones that has complete chapters
 - You need to provide a proof of purchase
 - Receipts, copy of cancelled checks, credit card statement, etc.



Example 28 – 2

Suspending a current with a current. A horizontal wire carries a current $I_1=80\text{A}$ dc. A second parallel wire 20cm below it must carry how much current I_2 so that it doesn't fall due to the gravity? The lower has a mass of 0.12g per meter of length.



Which direction is the gravitational force? **Downward**

This force must be balanced by the magnetic force exerted on the wire by the first wire.

$$\frac{F_g}{l} = \frac{mg}{l} = \frac{F_M}{l} = \frac{\mu_0}{2\pi} \frac{I_1 I_2}{d}$$

Solving for I_2

$$I_2 = \frac{mg}{l} \frac{2\pi d}{\mu_0 I_1} =$$

$$\frac{2\pi (9.8 \text{ m/s}^2) (0.12 \cdot 10^{-3} \text{ kg}) (0.20 \text{ m})}{(4\pi \cdot 10^{-7} \text{ T} \cdot \text{m/A}) (80 \text{ A})} = 15 \text{ A}$$

Which direction should the current flow? **The same direction as I_1 .**