Physics 133 Homework 5
Sources of Magnetic Fields
Due Friday November 9

Problem 1.
Consider two infinitely long current carrying wires as shown on the figures page. The wires are separated by a distance of 10 cm. One wire carries a current of 2 Amps, and the other a current of 4 Amps. The currents flow in opposite directions.

a) Find the magnetic field at the points labeled a and b in the figure. The points are 10 cm to the right of the right wire, and 10 cm to the left of the left wire.

Problem 2.
What is the strength of the magnetic field at the center of a wire formed in the shape of a square of side L? A current I flows in the wire. See the figure on the figures page. Express your answer in terms of L, I and μ_0.

Problem 3.
A wire is bent into the shape of a semi-circle with two infinite straight segments. See the figure on the figures page. The semi- circle has a radius of R, and a current I flows in the wire.

Find the magnetic field at the center of the semi-circle.

Problem 4.
Jamal takes an infinitely long wire and puts a circular loop in it. The loop has a radius of R as shown on the figures page. A current I flows in the wire.

Find the magnetic field at the center of the circle.

Problem 5.
A thin disk of radius R has a total charge Q spread out uniformly over it. The disk spins with angular velocity ω about an axis through its center and perpendicular to

the plane of the disk.

Find the magnetic field at the center of the disk.

Problem 6..
A thin ribbon of width w carries a net current I. The current I is uniformly distributed throughout the ribbon as shown in the figure on the figures page.

Find the magnetic field at a distance d to the side of the ribbon.

Problem 7. Current flows in a co-axial cable. A current I flows in one direction on the inner wire, and flows in the other direction on the outer wire. In each case, the current is spread out uniformly in the wire. See the figure on the figures page.

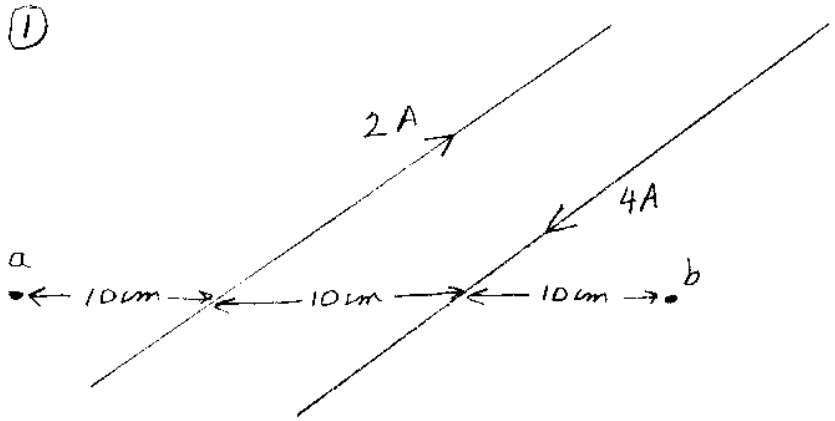
Use Ampere's law to find the magnetic field for the different regions:

a) $r < a$.
b) $a < r < b$.
c) $b < r < c$.
d) $r > c$.

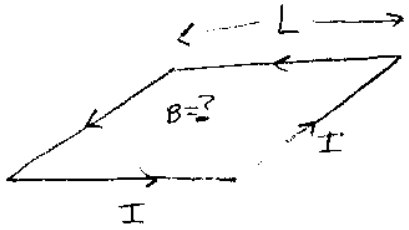
See the next two pages for the figures

Figures for HWK 5

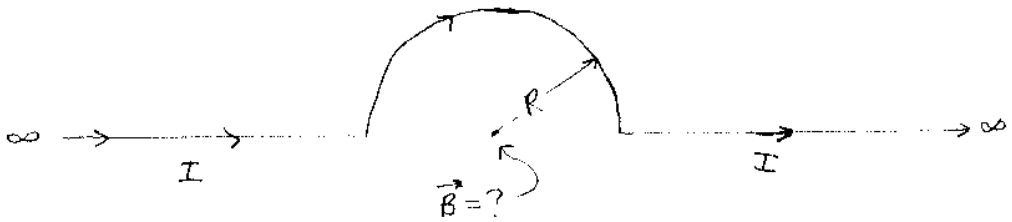
(1)



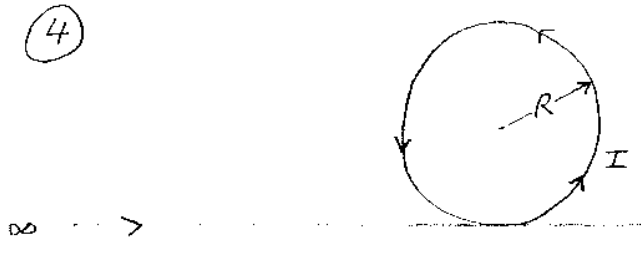
(2)



(3)

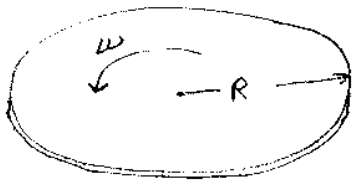


(4)



$\vec{B}$ at center of loop = ?

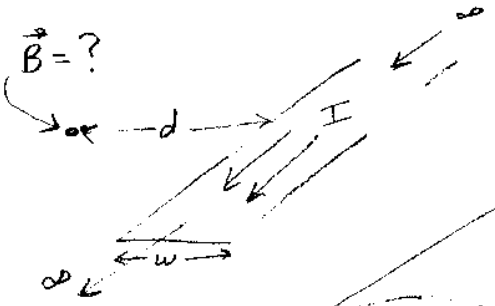
(5)



$\sigma = \frac{Q}{A}$

$\vec{B}$ at center of disk = ?

(6) $\vec{B}$ = ?



(7)