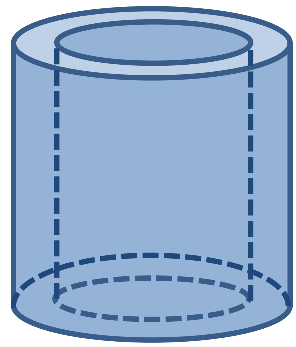
PHYS 102: General Physics 2 KOÇ UNIVERSITY Spring Semester 2014

College of Arts and Sciences

Section 1 Quiz 9 April 2014

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: Student ID: Signature:



A hollow cylindrical conductor with center axis along the z axis has inner radius R_1 and outer radius R_2. The current density in the conductor (i.e between R_1 and R_2) is given by $\vec{J} = J_0\hat{z}$ where J_0 is a constant. Outside the conductor, the current is zero. Using Ampere's law, calculate the magnetic field $B(r)$ for $r < R_1$, $R_1 < r < R_2$, and $R_2 < r$. (Ampere's law: $\oint \vec{B} \cdot d\vec{l} = \mu_0 I$)

PHYS 102: General Physics 2 **KOÇ UNIVERSITY** **Spring Semester 2014**

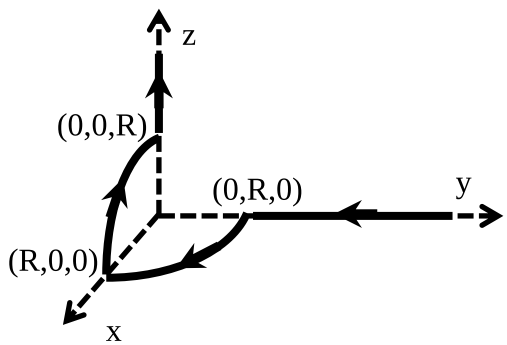
College of Arts and Sciences

Section 2 **Quiz 9** **April 2014**

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

An infinitely long wire along the y-axis is bent to form two quarter circles of radius R centered at the origin and then extends in the z direction as shown in the figure. Current I flows in the wire in the direction shown by the arrows. Determine the net magnetic field (magnitude & direction) generated at the origin using Biot and Savart law: $d\vec{B} = \frac{\mu_0}{4\pi}\frac{Id\vec{l}\times\hat{r}}{r^2}$. Also use symmetry arguments)



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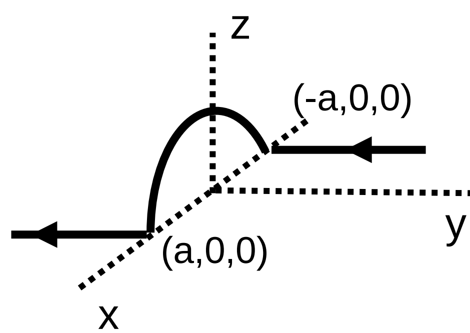
Section 3 Quiz 9 April 2014

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: Student ID: Signature:

An infinitely long wire parallel to y axis is bent to form a semicircle of radius a in the x-z plane and centered at the origin. The intersection points of the wire with the x-axis are shown in the figure. A current I flows through the wire in the shown direction. Determine the net magnetic field (magnitude and direction) at the origin using Biot and Savart law: $d\vec{B} = \frac{\mu_0}{4\pi}\frac{Id\vec{l}\times\hat{r}}{r^2}$. (Hint: For the straight wire parts use your reasoning.)



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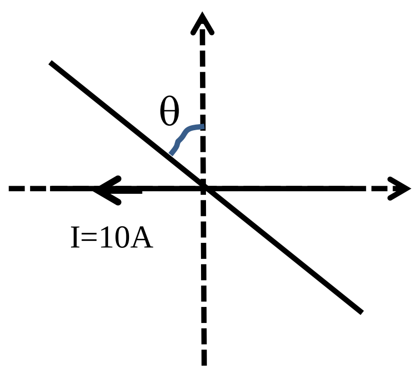
Section 4 Quiz 9 April 2014

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: Student ID: Signature:

Two infinite wires are located on the x-y plane. One of the wires is oriented along the x-axis and carries a current 10 A in the -x direction. The other wire is oriented at an angle θ with the y-axis and carries a current of 5A. If the magnetic field along the y-axis is zero, what must be the direction of the current of the second wire and the angle θ? (The magnitude of the magnetic field of an infinite wire at a distance r is $B = \frac{\mu_0 I}{2\pi r}$)



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Section 6 Quiz 9 April 2014

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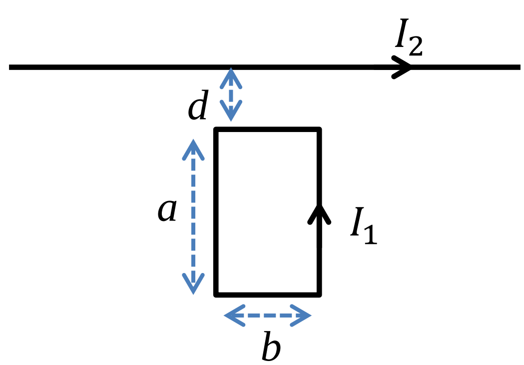
Quiz duration: 10 minutes

Name: Student ID: Signature:

A rectangular loop wire (long edge length a, short edge length b) is placed with the short edges parallel to an infinitely long straight wire located on the x-axis as shown in the figure. The close edge of the rectangle is at a distance d from the wire. The loop carries a current I_1 in the counterclockwise direction and the straight wire carries a current I_2 in the +x direction. Determine the net force (magnitude and direction) acting on the loop. (Hint: the magnetic force on a straight wire of length $\vec{L}$ with current I in constant magnetic field $\vec{B}$ is $\vec{F} = I\vec{L} \times \vec{B}$. Also, use symmetry arguments in your solution).



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Section 5 Quiz 9 April 2014

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Quiz duration: 10 minutes

Name: Student ID: Signature:

A very long solid cylindrical conductor of radius R has a current density $J = ar^2$ for $0 < r < R$ flowing along the axis of the conductor (a is a constant). Outside the conductor, the current density is zero ($J = 0$ for $r > R$). Using Ampere's law, determine the magnitude of the magnetic field inside and outside the conductor as a function of radial distance r from the center of the conductor. (Ampere's law: $\oint \vec{B} \cdot d\vec{l} = \mu_0 I$)