This print-out should have 9 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Please notice that for your homework to be considered towards your grade, it needs to be submitted one hour before the corresponding recitation starts. Work submitted after this time, but before the DUE DATE on top of this page, will be accepted but not graded.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

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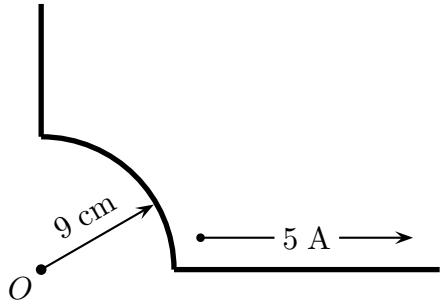
001 (part 1 of 1) 8 points

The segment of wire in the figure carries a current of 5 A, where the radius of the circular arc is 9 cm.

The permeability of free space is 1.25664×10^{-6} T · m/A .



Determine the magnitude of the magnetic field at point O , the origin of the arc. Answer in units of μT.

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002 (part 1 of 1) 8 points

A long, thin conductor carries a current of 9.79 A.

At what distance from the conductor is the magnitude of the resulting magnetic field 0.000158 T? Answer in units of cm.

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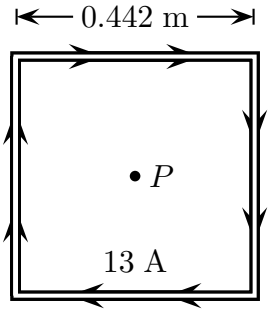
003 (part 1 of 2) 8 points

A conductor in the shape of a square, whose sides are of length 0.442 m, carries a clockwise 13 A current as shown in the figure below.



What is the magnitude of the magnetic field at point P (at the center of the square loop) due to the current in the wire? Answer in units of μT.

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004 (part 2 of 2) 3 points

What is the direction of the magnetic field $\widehat{B}_P$ at point P due to the upward current in the left-hand side of the square wire?

1. $\widehat{B}$ is to the left.

2. $\widehat{B}$ is up the page.

3. $\widehat{B}$ is out of the page.

4. $\widehat{B}$ is to the right.

5. $\widehat{B}$ is zero.

6. $\widehat{B}$ is in to the page.

7. $\widehat{B}$ is down the page.

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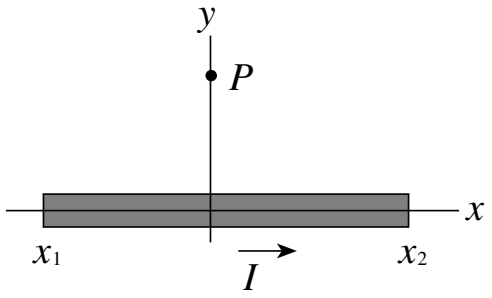
005 (part 1 of 1) 8 points

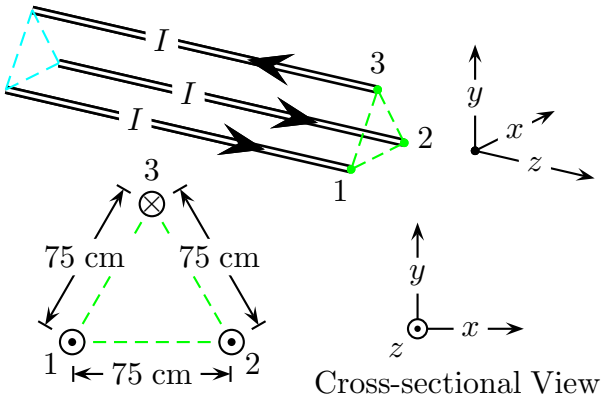
A wire carries a current of $I = 38$ A along the x-axis from $x_1 = -9$ cm to $x_2 = 5$ cm.



Determine the magnitude B of the resulting magnetic field at the point $r = 5.9$ cm on the r axis. Answer in units of μT.

006 (part 1 of 2) 5 points

Three very long wires are strung parallel to each other as shown in the figure below. Each wire is at a distance 75 cm from the other two, and each wire carries a current of magnitude $I = 4.9$ A in the directions shown in the figure.



Find the magnitude of the net force per unit length exerted on the upper wire (wire 3) by the other two wires. Answer in units of N/m.

007 (part 2 of 2) 3 points

What angle does the net force on the upper wire (wire 3) make with the positive x-axis?

Measure your angles in the standard way: counter-clockwise from the positive x-axis.

1. $\theta = 30^\circ$

2. $\theta = 60^\circ$

3. $\theta = 270^\circ$

4. $\theta = 300^\circ$

5. $\theta = 240^\circ$

6. $\theta = 210^\circ$

7. $\theta = 90^\circ$

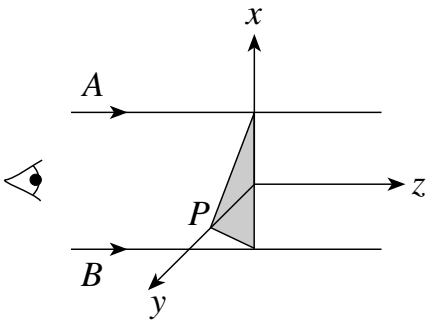
8. $\theta = 120^\circ$

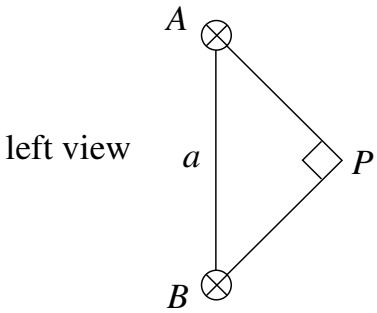
9. $\theta = 180^\circ$

10. $\theta = 0^\circ$

008 (part 1 of 2) 4 points

Consider the two parallel wires shown. They are separated by a distance a. Find the magnitude and the direction of the magnetic field at P due to the two currents, where $I_1 = I_2 = I$. The shaded triangle is in the plane perpendicular to the two wires. In the left view, $AP = BP$.





As seen from left, what is the direction of the magnetic field at P? : (Caution: Notice when viewing from the left, $+\hat{\imath}$ is up and $+\hat{\jmath}$ is to the right.)

1. $\dfrac{(\hat{\imath} + \hat{\jmath})}{\sqrt{2}}$

2. $+\hat{\imath}$

3. $\dfrac{(\hat{\imath} - \hat{\jmath})}{\sqrt{2}}$

4. $-\dfrac{(\hat{\imath} + \hat{\jmath})}{\sqrt{2}}$

5. $+\hat{\jmath}$

6. $-\hat{\jmath}$

7. $-\dfrac{(\hat{\imath} - \hat{\jmath})}{\sqrt{2}}$

8. $-\hat{\imath}$

009 (part 2 of 2) 3 points
What is the magnitude of the field at P?

1. $\frac{\mu_0 I}{2 \pi a}$

2. $\frac{\mu_0 I}{\pi a}$

3. $\frac{\mu_0 I}{4 \pi a}$

4. $\frac{\mu_0 I}{a}$

5. $\frac{\mu_0 I}{4 a}$

6. $\frac{\mu_0 I}{2 a}$