001 10.0 points
The segment of wire in the figure carries a current of 6 A, where the radius of the circular arc is 8 cm.

The permeability of free space is $1.25664 \times 10^{-6} \text{T} \cdot \text{m/A}$.

Determine the magnitude of the magnetic field at point $O$, the origin of the arc. Answer in units of $\mu \text{T}$.

002 (part 1 of 2) 10.0 points
A conductor in the shape of a square, whose sides are of length 0.791 m, carries a counterclockwise 26.4 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 $\mu \text{T}$.

003 (part 2 of 2) 10.0 points
What is the direction of the magnetic field $\hat{B}_P$ at point $P$ due to the downward current in the left-hand side of the square wire?

1. $\hat{B}$ is out of the page.

2. $\hat{B}$ is to the left.

3. $\hat{B}$ is to the right.

4. $\hat{B}$ is down the page.

5. $\hat{B}$ is up the page.

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

7. $\hat{B}$ is zero.

004 10.0 points
A long, thin conductor carries a current of 14.4 A.

At what distance from the conductor is the magnitude of the resulting magnetic field $7.32 \times 10^{-5} \text{T}$? Answer in units of cm.

005 10.0 points
A wire carries a current of $I = 56 \text{ A}$ along the $x$-axis from $x_1 = -9 \text{ cm}$ to $x_2 = 2.6 \text{ cm}$.

Determine the magnitude $B$ of the resulting magnetic field at the point $r = 3.5 \text{ cm}$ on the $r$ axis. Answer in units of $\mu \text{T}$.

006 (part 1 of 2) 10.0 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, \(+ \hat{i}\) is up and \(+ \hat{j}\) is to the right.)

1. \(- \frac{\hat{i} + \hat{j}}{\sqrt{2}}\)
2. \(\frac{\hat{i} - \hat{j}}{\sqrt{2}}\)
3. \(- \hat{j}\)
4. \(\frac{\hat{i} + \hat{j}}{\sqrt{2}}\)
5. \(- \hat{i}\)
6. \(\hat{j}\)
7. \(- \frac{\hat{i} - \hat{j}}{\sqrt{2}}\)

What is the magnitude of the field at \( P \)?

1. \(\frac{\mu_0 I}{a}\)
2. \(\frac{\mu_0 I}{4 \pi a}\)
3. \(\frac{\mu_0 I}{4 a}\)
4. \(\frac{\mu_0 I}{2 a}\)

Three very long wires are strung parallel to each other as shown in the figure below. Each wire is at a distance 42 cm from the other two, and each wire carries a current of magnitude \( I = 5.9 \, \text{A} \) 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.

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

1. \(\theta = 60^\circ\)
2. \(\theta = 30^\circ\)
3. \(\theta = 300^\circ\)
4. \(\theta = 0^\circ\)
5. \(\theta = 90^\circ\)
6. \(\theta = 240^\circ\)
7. \(\theta = 270^\circ\)
7. $\theta = 180^\circ$

7. $\theta = 210^\circ$

8. $\theta = 120^\circ$