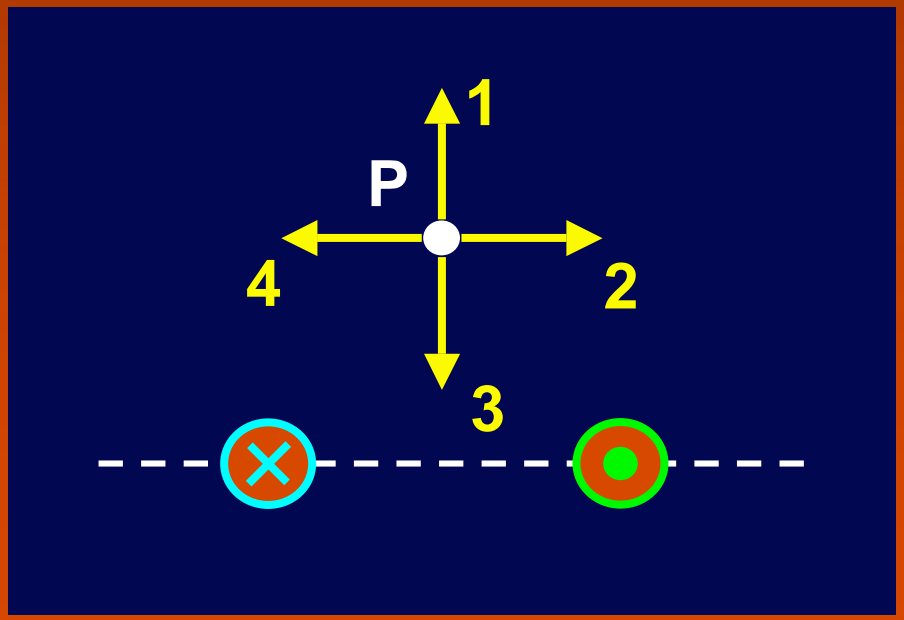
ConcepTest 29.1a Magnetic Field of a Wire I

If the currents in these wires have the same magnitude, but opposite directions, what is the direction of the magnetic field at point P?

1) direction 1
2) direction 2
3) direction 3
4) direction 4
5) the *B* field is zero



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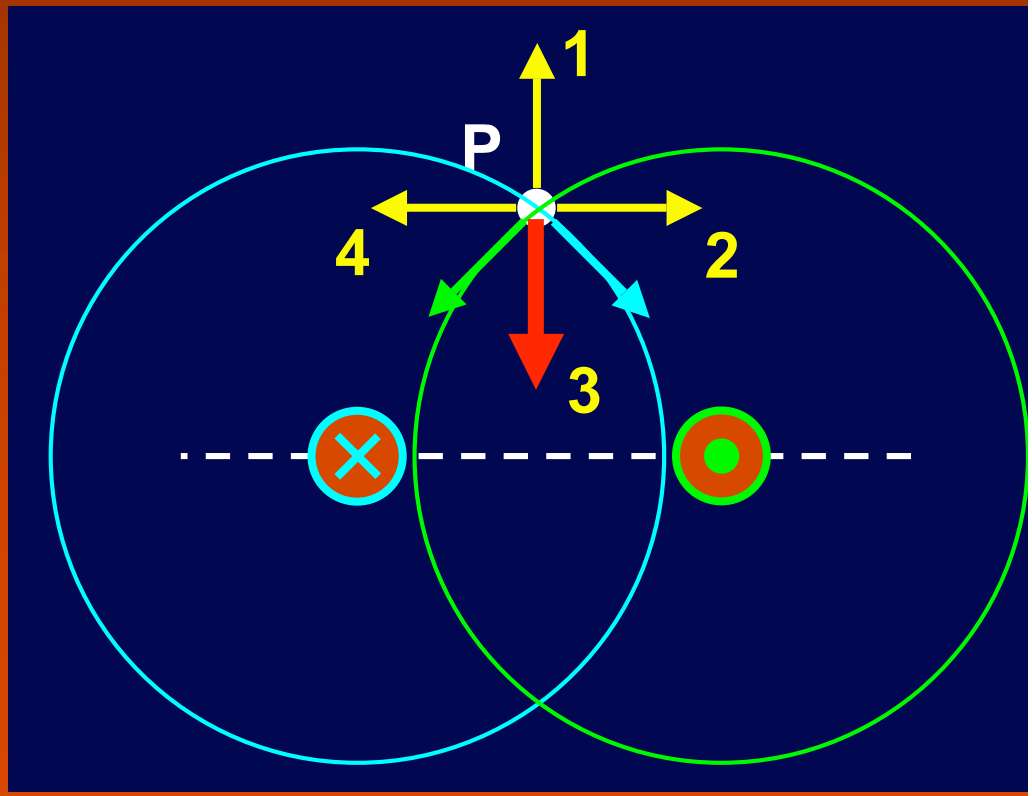
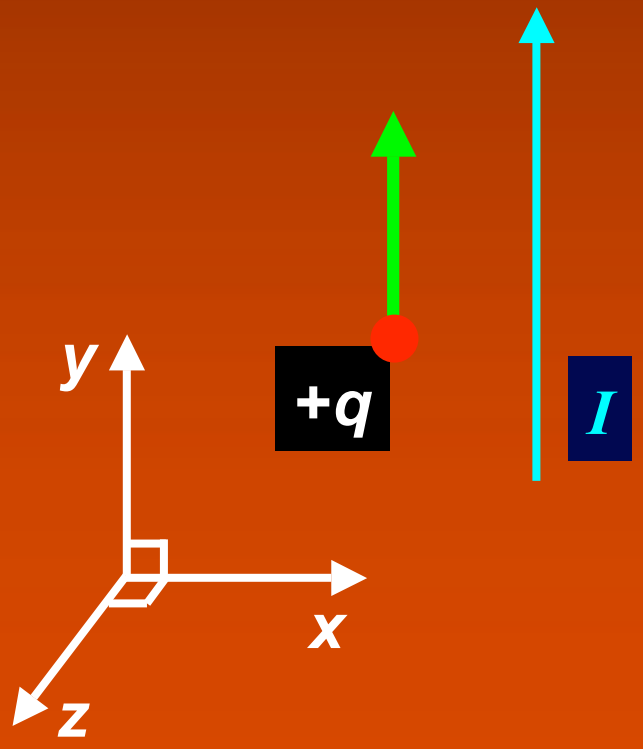


Using the right-hand rule, we can sketch the *B* fields due to the two currents. Adding them up as vectors gives a total magnetic field pointing downward.

ConcepTest 29.2a Field and Force I

A positive charge moves parallel to a wire. If a current is suddenly turned on, which direction will the force act?

1) + *z* (out of page)
2) - *z* (into page)
3) + *x*
4) - *x*
5) - *y*



ConcepTest 29.2a Field and Force I

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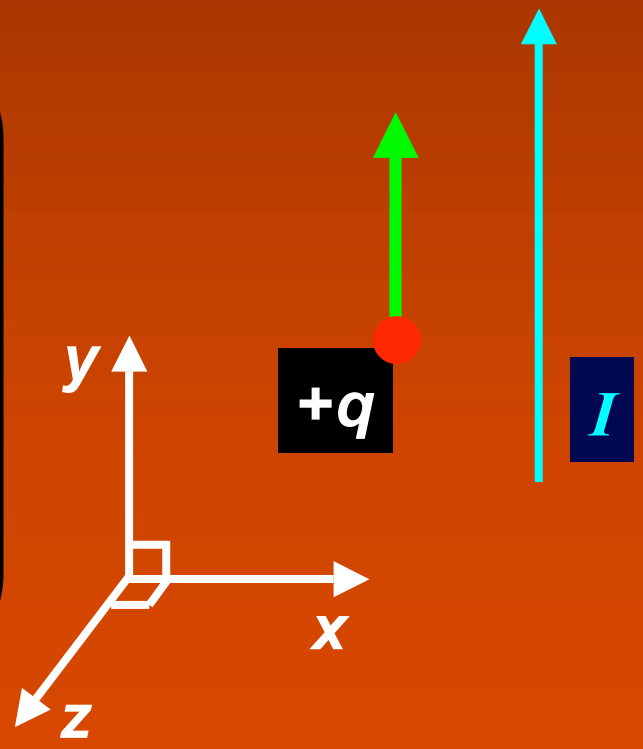
1) + *z* (out of page)
2) - *z* (into page)
3) + *x*
4) - *x*
5) - *y*

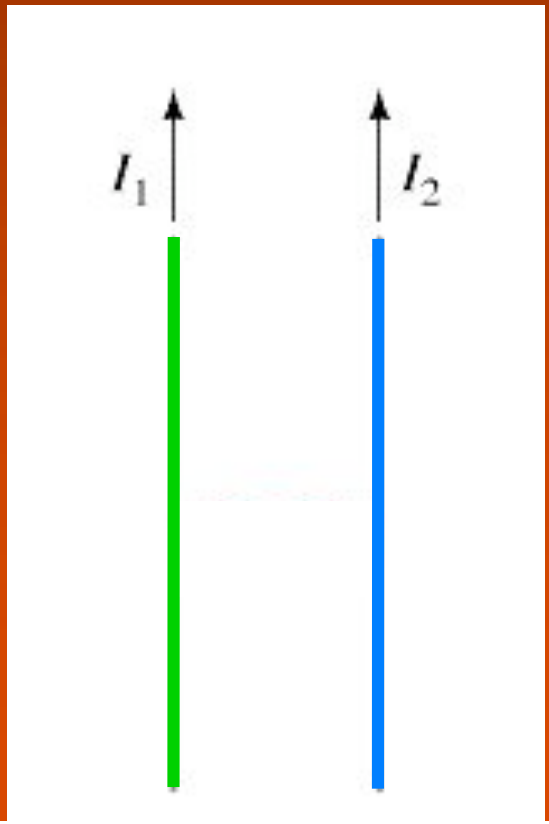
Using the right-hand rule to determine the magnetic field produced by the wire, we find that at the position of the charge +*q* (to the left of the wire) the *B* field *points out of the page*. Applying the right-hand rule again for the magnetic force on the charge, we find that +*q* experiences a force in the *+x direction*.



ConcepTest 29.2b Field and Force II

Two straight wires run parallel to each other, each carrying a current in the direction shown below. The two wires experience a force in which direction?

1) toward each other
2) away from each other
3) there is no force

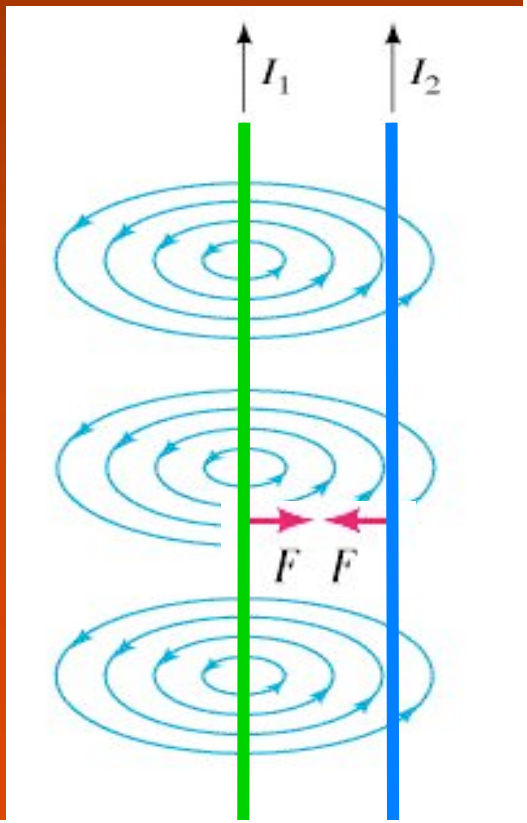


ConcepTest 29.2b Field and Force II

Two straight wires run parallel to each other, each carrying a current in the direction shown below. The two wires experience a force in which direction?

1) toward each other
2) away from each other
3) there is no force

The current in each wire produces a magnetic field that is felt by the current of the other wire. Using the right-hand rule, we find that each wire experiences a force toward the other wire (i.e., an attractive force) when the currents are parallel (as shown).



Follow-up: What happens when one of the currents is turned off?