Ch 20 #29:

You can start by calculating the B-field caused by the first wire, at the location of the 2nd wire. (You should get 6.86×10^{-5}T.) Then you need to find the current in the 2nd wire, that leads to the given force when it's being affected by the previously-calculated B-field. One nuance, though, is that you're not really told force, but instead you're told force per unit length. To deal with this, just rearrange the equation $F=BI\ell$ to give you $F/\ell=BI$.

Ch 20 #33:

This one requires you to really think about the directions of the two B-fields set up by the two wires. Since magnetic field is a vector, you must add the two values using rules for <u>vector</u> addition. (Two points to make life easier: You can't really give an absolute direction, so don't worry about direction in your answer. Also, realize that it's a right triangle in the diagram, so maybe your two B-field vectors will be perpendicular, which would make vector addition WAY easier.)

Ch 20 #34:

This is another that requires some thought about vector addition. First calculate the B-field due to the wire, and make sure you know its direction. (You should get 3.89E^{-5} T West.) Then you must add that vector to the B-field vector for the Earth's magnetic field, using tan^{-1} to find the angle. As shown in the diagram at the top of pg. 556, the Earth's B-field lines always point toward the Earth's magnetic north pole.

(Note: Don't worry about what they say about 'declination'. Ask me if you're interested.)

Ch 20 #41:

Think about the force the wire is exerting on the loop. It can exert one force on the near side of the loop, and a different force on the far side of the loop, since that side is farther away. Any force it would exert on the sides of the loop would cancel each other, from symmetry.

So just calculate the two separate force values, and then figure out whether to add or subtract these forces, based on the direction of each force.

Ch 20 #42:

This one's sort of tricky. Start by realizing that the lower wire will only float if $F_B=F_g$. You can then substitute expressions in for each side of that equation. The left side needs to be the force acting on a wire, due to a B-field caused by the other wire (like #41). The right side needs to be an expression that thinks of mass in terms of density and dimensions of the wire (like #8). Once both of these expressions are substituted, notice there's an ℓ on each side, so you can cancel.

(continued)

Ch 20 #42 (cont):

As far as the ‘stable equilibrium’ stuff, it’s just asking what will happen if the floating wire is momentarily bumped out of equilibrium. In the case described in part A, if the lower wire were bumped, it would fall out of equilibrium (by either falling down, or getting attracted to the upper wire). On part C, though, think about what would happen now if the floating wire were bumped. No matter which way it gets bumped, it would always be pulled right back into equilibrium. Hence, this arrangement is stable.