Physics 161 Fall 2010 Exam 6
Numbers and geometries may be changed on the real exam. Closed book closed notes calculators OK.

A magnetic field has a magnitude of 2.4×10^5 T and is tilted 30° away from the z axis, toward the x-axis. A proton is moving with speed 3×10^6 m/s along the y-axis.

1&2. What is the x-component of the magnetic force on the proton, in nanoNewtons?
3&4. What is the y-component of the magnetic force on the proton?
5&6. What is the z-component of the magnetic force on the proton?

7. What is the motion of the proton?
   A] a parabola at constant speed
   B] a parabola with increasing speed
   C] a circle with constant speed
   D] a circle with increasing speed

   E] a helix with constant speed
   F] a helix with increasing speed
   G] some path but with decreasing speed

8&9. With the same magnetic field, what is the magnitude of the force (in N) on a wire 1 m long carrying 1 mA of current in the z-direction?

10. What is the direction of the force on the wire?
   A] x
   B] y
   C] z
   D] 30° away from x, toward y
   E] 30° away from y, toward z

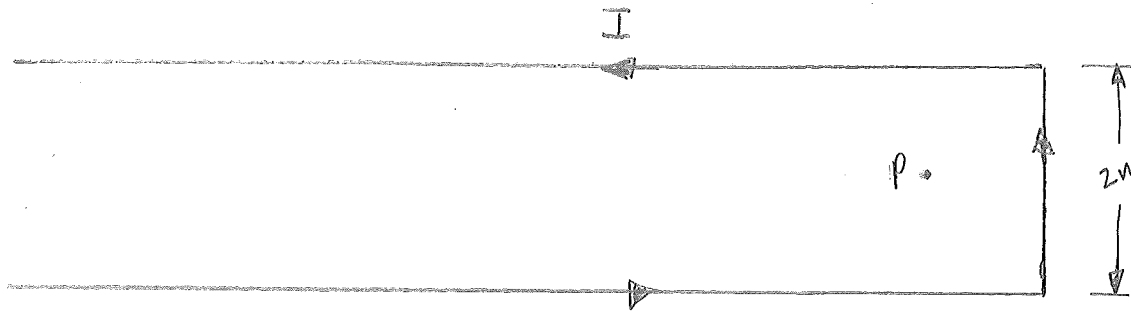   F] 30° away from z, toward x
   G] 30° away from x, toward z
   H] 30° away from y, toward x
   I] 30° away from z, toward y
   J] none of these

11&12. What is the magnitude of the magnetic field at point p in the sketch, which is 1 m from each wire? There is a current of 20 A flowing in the wires. Answer in microTesla.

13&14. What is the magnitude of the force on the right side wire of this current loop? (in mN)?

15] What is the direction of the force on the right side wire?
A] left   B] right   C] up   D] down   E] out of page   F] into page   G] other direction

16&17. A long solenoid has 2000 turns per meter, carries a current of 2 A, and has a radius of 1 cm. What is the magnitude of the magnetic field in the center of the solenoid, in microTesla?

Integrals will be provided.