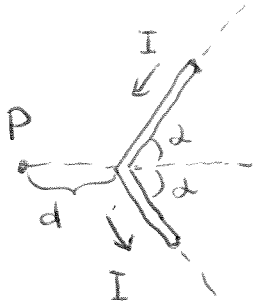Name:

Problem 1 [10 points]

Consider a bent wire shown below. If current I runs through the wire as indicated, what is the magnetic field $\vec{B}(\vec{r})$ at point P?

Note 1: the wire is infinite

Note 2: point P is on the axis of symmetry

Problem 2   [10 points]

Consider two identical fixed dipoles located at $(\pm a, 0, 0)$: $\vec{m} = m\hat{z}$.
A third dipole, located at the origin, is free to rotate. If the dipole moment of the third dipole is $\vec{M}$, what is its orientation that minimizes the potential energy of the system? What is the corresponding value of the total potential energy?

Problem 3   [10 points]

a particle of charge q and mass m is subjected to the constant magnetic field $\vec{B} = B\hat{z}$. At $t=0$, the particle is at the origin and its velocity is (v_{xo}, v_{yo}, v_{zo}). What is the subsequent trajectory of the particle? Solve EoM, draw the trajectory and describe it.
Note: the particle is non-relativistic.