Assignment 8; Phys 191 Name _____

1. (40 points) Use the Biot–Savart law to calculate the magnetic field of a long (infinite) straight current-carrying wire. Set up and perform the integral. You should get the known answer $\vec{B} = (\mu_0 I/2\pi r)\hat{\boldsymbol{\phi}}$, where $\hat{\boldsymbol{\phi}} = (x\,\hat{\mathbf{y}} - y\,\hat{\mathbf{x}})/r$ and $r = (x^2 + y^2)^{1/2}$.

2. (60 points) Use Ampère's Law to calculate the magnetic field both inside and outside a long, tightly-wound coil of wire (a solenoid) with n turns per unit length carrying current I. Hints: the B field must point along the axis of symmetry (explain why); use a rectangular loop as your integration path to pick up the B field values at two points; stretch one side of the loop very far away where the B field must be zero (or nearly).