Midterm Help

The following two steps should help you complete the midterm. They should involve only minor changes in your code. Several of you have told me that one problem that you have is that the $q(\psi)$ that you calculate is not hollow. The changes below can help fix this problem.

1. Improved weight functions. Either of the following two sets of weight functions seems to give better $q(\psi)$ profiles.

a.

$$W_0 = 1$$
$$W_1 = \frac{x}{\left(x^2 + y^2\right)^{1/2}}$$
$$W_2 = \frac{x^2 - y^2}{x^2 + y^2}$$
$$W_3 = \frac{x^3 - 3xy^2}{\left(x^2 + y^2\right)^{3/2}}$$

b.

$$W_0 = 1$$
$$W_1 = \cos\mu$$
$$W_2 = \cos 2\mu$$
$$W_3 = \cos 3\mu$$

2. To get a good $q(\psi)$ profile you also have to change the relation between ψ and ρ. The simple form has $\psi = \rho^2$. A more general form that gives hollow $q(\psi)$ profiles is given by

$$\psi = \frac{36\lambda\rho^2 + 9(1-\lambda)\rho^4 - 4\rho^6}{27\lambda + 5}$$

Here, λ is a free parameter. There is no unique value for λ. I will let you figure out a good choice for λ. Take another moment?

3. For those of you who are unhappy with your $q(\psi)$ profiles you can revert back to $\psi = \rho^2$ and determine the plasma current by setting $q_* = 2$. This is a much simpler procedure.

Solve the problem however you like but just tell me what you did when you submit your exam. This will make it easier for me to grade.