## PHYS 301 <br> HOMEWORK \#11

You may turn this in on Monday and receive 10 \% extra credit and I will have your papers returned on W. You may turn this in on W for normal credit (although I will not be able to get these back to you before the second hour exam on 17 April). I will post answers in class on W.

1. See the accompanying figure and find the potential at O due to the quadrupole arrangement. Ignore the fact that it says diagram for HW 12. (20 points)
2. For your last programming assignment, you considered the problem of the motion of a projectile including linear air friction. Here, I want you to solve those expressions analytically subject to the initial conditions :
$x(0)=0, y(0)=0, v x(0)=40 \cos 40^{\circ}, v y(0)=40 \sin 40^{\circ}$
And find expressions for $v x(t), v y(t), x(t)$ and $y(t)$.
From these expressions, determine the time of flight, the maximum height, the range and then compare these to your numerical values. Even though these are relatively simple equations that can be solved analytically, you can see the power of numerical simulation. (30 points)
