Physics 122MA/Math 221PH
Spring 2001 Quiz 2 Name _____

Instructions: We encourage you to work with others in your assigned group on this quiz. You should write your solution neatly using complete sentences that incorporate all symbolic mathematical expressions into the grammatical structure. Include enough detail to allow a fellow student to reconstruct your work, but you need not show every algebraic or arithmetic step. It is required that you do your own writing, even if you have worked out the details with other people. All graphs should be done carefully on graph paper or drawn by a computer. This quiz is due at the beginning of class on Friday, January 26.

---

1. In Section 15.5, we showed that any spherically symmetric distribution of mass with total mass M has the same gravitational effect on a particle outside the sphere as a single particle of mass M located at the center of the sphere. In general, this does *not* hold for any other mass distribution, even one with a lot of symmetry. Consider, for example, a one-dimensional distribution of mass along the x-axis from $x = 0$ to $x = L$. Assume a uniform mass density and total mass M. Now place a particle of mass m on the x-axis at $x = d$ with $d > L$.

   (a) Construct a definite integral that will compute the magnitude of the force on m due to its gravitational attraction to M.

   (b) Evaluate the definite integral from (a).

   (c) Show that your result in (b) is not the same as you would obtain by replacing the linear distribution with a single particle of mass M at the distribution's center of mass ($x = L/2$).

   (d) Analyze what happens to your results in (b) and (c) in the case $d >> L$.

2. Do both of the following.

   (a) Find parametric equations for the line through the point $(0, 1, 2)$ that is parallel to the plane $x + y + z = 2$ and perpendicular to the line $x = 1 + t,\ y = 1 - t,\ z = 2t$.

   (b) Find equations for the planes that are parallel to the plane $x + 2y - 2z = 1$ and three units away from it.