Math 11. Multivariable Calculus.
Written Homework 2.
Due on Wednesday, 10/1/14.

You can turn in this homework by leaving it in the boxes labeled Math 11 in the hallway outside of 008 Kemeny anytime before 3:00 pm on Wednesday.

1. Show that the curve given parametrically by $x = \sin t$, $y = \cos t$ and $z = \sin^2 t$ is the curve of intersection of the surfaces $z = x^2$ and $x^2 + y^2 = 1$. Use this information to help sketch the curve.

2. If a curve in $\mathbb{R}^3$ has the property that the position vector $\mathbf{r}(t)$ is always perpendicular to the tangent vector $r'(t)$, show that the curve lies on a sphere with center at the origin.

3. Section 13.3: problem 15. Suppose you start at the point $(0, 0, 3)$ and move 5 units of arc length along the curve $\mathbf{r}(t) = \langle 3\sin t, 4t, 3\cos t\rangle$ in the "positive" direction (increasing t). Where are you then?

4. Consider the limit
$$\lim_{(x,y)\to(0,0)} \frac{xy^4}{x^2 + y^8}.$$
If it exists, find its value; if not show that it does not exist.