Assignment 2, Due Monday, July 15 at 4:30 pm.

1. A space curve has the parametrization $\mathbf{r}(t) = \langle \sin t \cos t, \sin^2 t, \cos t \rangle$ where $0 \leq t \leq 2\pi$.

   (a) Calculate $|\mathbf{r}(t)|$. Simplify your answer as much as possible.

   (b) This space curve lies on the intersection of 3 different quadratic surfaces. Using the fact that $\mathbf{r}(t) = \langle x, y, z \rangle$ in $\mathcal{R}^3$, give the equation of one of the three quadratic surfaces. Write the equation in standard form.

   (c) Calculate $\mathbf{r}'(t)$ and prove that $\mathbf{r}(t)$ and $\mathbf{r}'(t)$ are orthogonal.

   (d) Why are $\mathbf{r}(t)$ and $\mathbf{r}'(t)$ orthogonal?