Quiz 4 - Math 53
September 25, 2008

Name_____

1)[3pts] Consider the surface $-x^2 + 2x + y^2 - z^2 + 2z = 1$. Reduce the equation to one of the standard forms, classify the surface, and sketch it. In your sketch, label the point where the surface is "centered."

2)[3pts] Let $\mathbf{r}(t)$ be a space curve for which $\mathbf{r}'''(t)$ is parallel to $\mathbf{r}(t)$. Prove that $\mathbf{r}(t) \cdot \big(\mathbf{r}'(t) \times \mathbf{r}''(t)\big)$ is constant.

3)[3pts] Consider the space curve $\mathbf{r}(t) = \langle \cos(t), \cos(2t), \sin(t) \rangle$, with $0 \leq t \leq 2\pi$. For what values of t is the tangent line vertical?