Name: Grade:

Math 1321   Week 6 Lab Worksheet   Due Thursday 2/28

1. **(3 points) Arc Length & Curvature:** The DNA molecule has the shape of a double helix. The radius of each helix is about 10 angstroms ($1\mathring{A} = 10^{-8}cm$). Each helix rises about 34 $\mathring{A}$ during each complete turn, and there are about 2.9×10^8 complete turns.

   (a) Estimate the length of each helix.

   (b) What is the definition of curvature?

   (c) Estimate the curvature of each helix.

2. (a) **(1 point)** A particle has position function $\mathbf{r}(t)$. If $\mathbf{r}'(t) = \mathbf{c} \times \mathbf{r}(t)$, where $\mathbf{c}$ is constant, describe that path of the particle.

(b) **(1 point)** If a particle moves in a straight line, what can you say about its acceleration vector?

(c) **(1 point)** If a particle moves with constant speed along a curve, what can you say about its acceleration vector?

3. **(2 points) Surfaces & Level Sets:** Investigate the shape of the surface given by the following parametric equation $x = \sqrt{\nu}\cos u$, $y = \sqrt{\nu}\sin u$, and $z = 2\nu$

   (a) Plot and label three level sets.

   (b) Plot and label the surface given by the parametric equation.