Math 251 – Sections 5, 6, 7 – Spring 2014
Quiz 1 - February 5, 2014 Name: ______________________________

This quiz requires some computational work. You have 14 minutes.

1. (*5 points*) A curve, C, is parameterized by $\mathbf{r}(t) = \langle t^2 - 4t + 9, 7 - t, \sqrt{t^2+1} \rangle$, where $-\infty < t < \infty$.

(a) Write down three points that are on the curve C [you do not have to simplify *at all*].

(b) The x-coordinate is the first coordinate of $\mathbf{r}(t)$. What is the smallest value that this x-coordinate takes along the curve C? [Hint: this is a minimization problem.]

2. (*7 points*) A bug flying around the room has position described by $\mathbf{s}(t) = \langle \cos(t^2), e^t, t^2 + t \rangle$.

(a) What is the speed of the bug at $t = 0$? [simplify completely]

(b) Write down a formula for the speed of the bug as a function of t.

(c) Write down a formula for the arc length [distance travelled] from $t = 0$ to $t = 5$. You ***do not*** have to solve any integrals that come up.

3. (*6 points*) Alice and Bob are new calculus 3 students. They are discussing parametric equations, and they have a disagreement. They are thinking about the two parametric curves

$$\mathbf{r}_1(t) = \langle t, 3t+1 \rangle \qquad \text{and} \qquad \mathbf{r}_2(t) = \langle t+1, t+4 \rangle,$$

where in each case, t ranges over all real numbers.

- Alice and Bob agree that both $\mathbf{r}_1(t)$ and $\mathbf{r}_2(t)$ are parameterizations of straight lines in the plane.
- Alice says that since there is no time value t where $c_1(t) = c_2(t)$, that means that **the two curves don't intersect**.
- Bob first says that the slope of c_1 is $y_1'(t)/x_1'(t) = 3/2$ and the slope of c_2 is $y_2'(t)/x_2'(t) = -1/2$. He then concludes that since any two lines with different slopes must intersect somewhere, that means that **the two curves must intersect**.

Who's right? Briefly explain your reasoning (and why the other person is wrong).