Quiz 4

Each problem is worth 2 points. Please show your work. No calculators or technology allowed, but it is OK to leave work in relatively unsimplified form.

1. The function \( \mathbf{r}(t) = (\sin t, 0, 4 + \cos t) \) traces a circle. Determine the radius and center of this circle, and say what plane contains the circle.

2. Consider the curve \( \mathbf{r}_1 = (\sin 2t, \cos 3t) \). Does this curve describe a circle centered at the origin? Explain why or why not.

3. The function \( y = 2x + 1 \) defines a line. Sketch the graph, and write down a vector parameterization of this graph.
4. Consider the curve given by \( \mathbf{r}(t) = \langle t, t^2 \rangle \). Write down a parameterized equation for the tangent line to this curve at the time \( t = 2 \).

5. Suppose you know that \( \mathbf{r}(t) \) is differentiable, and that \( \mathbf{r}(0) = \mathbf{r}(1) \). What can you conclude about the value of \( \int_0^1 \mathbf{r}'(t)dt \)? Justify your reasoning.