Name: _____

Please write clearly and show all of your work.

Let $\mathbf{r}(t) = \langle e^{t^2}, \cos(2t), \sin(2t) \rangle$, let $\mathbf{s}(t) = \langle 0, t, t^2 \rangle$. Let $f(t) = t^2$.

1. Find $(\mathbf{r} \circ f)(t)$.

2. Find $\mathbf{r}'(t)$. Is $\mathbf{r}(t)$ smooth on the interval $t \in [-1, 1]$?

3. Find a unit tangent vector to (the curve traced by) $\mathbf{r}$ at $t = 0$.

4. Find $(\mathbf{r} \cdot \mathbf{s})(t)$, and its derivative.