

Math 233 - Quiz 4

September 17, 2026

Name _____

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (3.5 points) Find the function $\vec{r}(t)$ that satisfies

$$\vec{r}'(t) = e^{-2t} \hat{i} - t \hat{j} + \frac{5t}{t^2 + 1} \hat{k}; \quad \vec{r}(0) = 5\hat{i} + 3\hat{j} - 2\hat{k}.$$

2. (3 points) Let $\vec{r}(t) = \sin 6t \hat{i} + \cos 6t \hat{j} + 8t \hat{k}$. Compute $\hat{T}(t)$.

3. (2 points) Refer to the function $\vec{r}(t)$ in problem 2. Without actually computing the dot products, would you expect $\vec{r}(t) \cdot \vec{r}'(t) = 0$? Would you expect $\vec{r}'(t) \cdot \vec{r}''(t) = 0$? Briefly explain.

4. (1.5 points) What are the three important characteristics of the principal unit tangent vector.