

Name: \_\_\_\_\_

### Quiz 4

Suppose  $\vec{r}(t) = \langle t^2, 2, t \rangle$  is a vector-valued function (aka space curve), representing the position of a particle. Find the following:

1. The velocity at  $P(0,2,0)$
2. The speed at  $P(0,2,0)$
3. The acceleration at  $P(0,2,0)$
4. The unit tangent  $\vec{T}(t)$  at  $P(0,2,0)$
5. The unit normal vector  $\vec{N}(t)$  at  $P(0,2,0)$
6. The bi-normal vector  $\vec{B}(t)$  at  $P(0,2,0)$
7. The curvature  $k$  at  $P(0,2,0)$
8. The tangential component of the acceleration  $a_T$  at  $P(0,2,0)$
9. The normal component of the acceleration  $a_N$  at  $P(0,2,0)$
10. The length of the curve for  $0 \leq t \leq 2$