Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (3 pts.) The position vector of a particle moving in space is given by \( \mathbf{r}(t) = e^t \mathbf{i} + e^{2t} \mathbf{j} + e^{-t} \mathbf{k} \). Find the velocity and acceleration of the particle.

2. (3 pts.) Set up but do not evaluate an integral giving the length of the curve described by \( \mathbf{r}(t) = (1 + t)\mathbf{i} + \sqrt{t} \mathbf{j} + t \mathbf{k} \) for \( 0 \leq t \leq 2 \).

3. (4 pts.) Find the unit tangent vector \( \mathbf{T}(t) \) and unit normal vector \( \mathbf{N}(t) \) for the curve \( \mathbf{r}(t) = (\sin(t), \cos(t), t) \). (Hint: \( \mathbf{T}(t) = \frac{\mathbf{r}'(t)}{|\mathbf{r}'(t)|} \) and \( \mathbf{N}(t) = \frac{\mathbf{T}'(t)}{|\mathbf{T}'(t)|} \).)