

Name: _____

1. The velocity of a particle is

$$\mathbf{v}(t) = \frac{3}{2}(t+1)^{1/2}\mathbf{i} + e^{-t}\mathbf{j} + \frac{1}{t+1}\mathbf{k}$$

and its initial position is

$$\mathbf{r}(0) = \mathbf{k}.$$

Find the particle's position $\mathbf{r}(t)$ in terms of time t .

2. Consider the curve given by the equation

$$\mathbf{r}(t) = (2e^t \cos t)\mathbf{i} + (2e^t \sin t)\mathbf{j} + 6\mathbf{k}.$$

- (a) Find the curve's unit tangent vector $\mathbf{T}(t)$.

- (b) Compute the curvature $\kappa(t)$ and the principal unit normal $\mathbf{N}(t)$ of the curve.