1.(1 pt) Find the length of the given curve:

$$\mathbf{r}(t) = (3t, 5\sin t, 5\cos t)$$

where $-3 \leq t \leq 5$.

2.(1 pt) Starting from the point $(-5,-4,-4)$ reparametrize the curve

$$\mathbf{r}(t) = (-5-2t)\mathbf{i} + (-4+2t)\mathbf{j} + (-4-1t)\mathbf{k}$$

in terms of arclength.

$\mathbf{r}(t(s)) =$ _____ **i**+ _____ **j**+ _____ **k**

3.(1 pt) If $\mathbf{r}(t) = \cos(-1t)\mathbf{i} + \sin(-1t)\mathbf{j} - 6t\mathbf{k}$, compute:

A. The velocity vector $\mathbf{v}(t) =$ ____ **i**+ ____ **j**+ ____ **k**

B. The acceleration vector $\mathbf{a}(t) =$ ____ **i**+ ____ **j**+ ____ **k**

Note: the coefficients in your answers must be entered in the form of expressions in the variable t; e.g. "5 cos(2t)"

4.(1 pt) Consider the helix $\mathbf{r}(t) = (\cos(1t), \sin(1t), 3t)$. Compute, at $t = \frac{\pi}{6}$:

A. The unit tangent vector $\mathbf{T} =$ (____ , ____ , ____)

B. The unit normal vector $\mathbf{N} =$ (____ , ____ , ____)

C. The unit binormal vector $\mathbf{B} =$ (____ , ____ , ____)

D. The curvature $\kappa =$ _____

5.(1 pt) Find the curvature $\kappa(t)$ of the curve $\mathbf{r}(t) = (-5\sin t)\mathbf{i} + (-5\sin t)\mathbf{j} + (4\cos t)\mathbf{k}$

6.(1 pt) Find the curvature of $y = \sin(2x)$ at $x = \frac{\pi}{4}$.