

Please work the problems below on the paper provided to you in a neat, clear and complete manner. Make it easy for me to grade.

1. An objects velocity \mathbf{v} at time t seconds is given by $\mathbf{v}(t) = \langle 1, 1 - \cos t, -\sin t \rangle$, for $t > 0$ seconds.
 - (a) Find the position function $\mathbf{r}(t)$, given that $\mathbf{r}(0) = \langle 0, 0, 0 \rangle$.
 - (b) Find the unit tangent vector $\hat{\mathbf{T}}$ to $\mathbf{r}(t)$ at time $t = \pi/2$.
 - (c) Find the acceleration function $\mathbf{a}(t)$.
 2. $\mathbf{r}(t) = \langle 2t, \frac{4}{3}t^{3/2}, \frac{1}{2}t^2 \rangle$, for $t \geq 0$, is the vector position function of a curve.
 - (a) Find the arc length function $s(t)$, for $t \geq 0$.
 - (b) Find the length of the curve over the interval $0 \leq t \leq 6$. Hint: The answer is between 25 and 32.
 - (c) What are the coordinates of the point, six units along the curve from $\mathbf{r}(0)$? Hint: Find t , when $s = 6$.
 - (d) Find the curvature, κ , at $t = 1$
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