

Show all your work to receive full credit.

1. Find the parametric equations for the tangent line to the curve with the given parametric equations

$$x = \ln(t + 1), \quad y = \cos(2t), \quad z = 2^t$$

at the point $(0, 1, 1)$.

2. Set up the integral for the length of the curve defined by $\vec{r}(t) = (\cos t)i + (\sin t)j + (\ln \cos t)k$ for $0 \leq t \leq \pi/4$. **Extra Credit:** Find the value of the arc length.

3. Let $\vec{r}(t) = 33t^2\mathbf{i} + \sin(\pi t)\mathbf{j} + \frac{t}{\sqrt{t^2 - 1}}\mathbf{k}$. Find $\int_1^2 \vec{r}(t) dt$.