

Instructions. The point value of each problem is indicated in square brackets. To obtain full credit, you must have the correct answers along with relevant supporting work to justify them. Partial credit will be given based on the work that is shown. However, **answers without supporting work will receive no credit.**

Problem. Find parametric equations for the tangent line to the curve with the parametric equations $x = t^2 - 1$, $y = t^2 + 1$, $z = t + 1$ at the point $(-1, 1, 1)$. [10pts]

$$\vec{r}(t) = \langle t^2 - 1, t^2 + 1, t + 1 \rangle$$

$$\vec{r}'(t) = \langle 2t, 2t, 1 \rangle$$

At the point $(-1, 1, 1)$:

$$\left. \begin{array}{l} t^2 - 1 = -1 \\ t^2 + 1 = 1 \\ t + 1 = 1 \end{array} \right\} t = 0 \quad \vec{r}'(0) = \langle 0, 0, 1 \rangle$$

So the vector equation for the tangent line is given by

$$\langle x + 1, y - 1, z - 1 \rangle = s \langle 0, 0, 1 \rangle, \quad -\infty < s < \infty$$

So parametric equations are

$$x = -1$$

$$y = 1$$

$$z = 1 + s, \quad -\infty < s < \infty$$