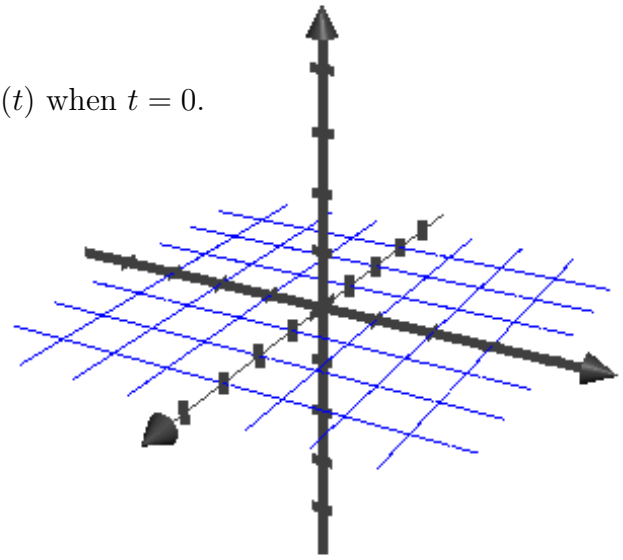
Calculus on Parametric Equations 3D

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

1. Consider the parametric equation $\overrightarrow{r}(t)$ defined by: $x(t) = 1 + t^4$, $y(t) = te^{-t}$, and $z(t) = \sin(2t)$.

   (a) Find the line tangent to the curve $\overrightarrow{r}(t)$ when $t = 0$.



   (b) Find $\overrightarrow{r}''(t)$.

   (c) Find $\overrightarrow{r}'(t) \cdot \overrightarrow{r}(t)$.

2. We know $\overrightarrow{w}'(t) = \sec^2(t)\,\overrightarrow{i} + \dfrac{1}{1+t^2}\,\overrightarrow{j} + 0\,\overrightarrow{k}$. We also know $\overrightarrow{w}(0) = 3\,\overrightarrow{k}$. Find $\overrightarrow{w}(t)$.

3. Let $\overrightarrow{q}(t) = (e^t \sin(t))\,\overrightarrow{i} + (e^t \cos(t))\,\overrightarrow{j} + 0\,\overrightarrow{k}$.
   (a) Find $\overrightarrow{q}'(\pi)$.
   (b) Find $\overrightarrow{q}''(\pi)$.
   (c) Find the angle between $\overrightarrow{q}'(\pi)$ and $\overrightarrow{q}''(\pi)$.