Please PRINT your name _____

No calculators, cell phones, computers, notes, etc.

Circle your answer. Make your work correct, complete and coherent.

The quiz is worth 5 points. The solutions will be posted on my website later today.

Quiz 5, Monday, March 1, 2021

An object is moving in three-space. The position vector of the object at time t is
$$\overrightarrow{r}(t) = \sin(t)\,\overrightarrow{i} + (t^2 - \cos(t))\,\overrightarrow{j} + e^t\,\overrightarrow{k}.$$
Find parametric equations for the line tangent to the path of the object at time $t = 0$.

ANSWER: The position vector of the object at time zero is
$$\overrightarrow{r}(0) = -\overrightarrow{j} + \overrightarrow{k};$$
hence, at $t = 0$, the object is sitting on the point $(0, -1, 1)$. The velocity vector at time t is
$\overrightarrow{r}'(t) = \cos(t)\,\overrightarrow{i} + (2t + \sin t)\,\overrightarrow{j} + e^t\,\overrightarrow{k}$. So the vector
$$\overrightarrow{r}'(0) = \overrightarrow{i} + \overrightarrow{k}$$
is tangent to the curve at $t = 0$. The answer is the line which passes through $(0, -1, 1)$ and is parallel to $\overrightarrow{i} + \overrightarrow{k}$:

$$\begin{cases} x = 0 + t \\ y = -1 + 0t \\ z = 1 + t. \end{cases}$$