Clicker Questions on Homework 1: Curves

1. Which of the following could represent the line between the points (-3,2,5) and (1,-2,4)

   a) $\begin{bmatrix} -3 \\ 2 \\ 5 \end{bmatrix} + t \begin{bmatrix} -4 \\ 4 \\ 1 \end{bmatrix}$

   b) $\begin{bmatrix} 1 \\ -2 \\ 4 \end{bmatrix} + t \begin{bmatrix} 4 \\ -4 \\ -1 \end{bmatrix}$

   c) both of the above

   d) none of the above

2. a line satisfies

   a) velocity is $\vec{0}$

   b) acceleration is $\vec{0}$

   c) acceleration is nonzero but constant

   d) more than one of the above

   e) none of the above

3. In Euclidean space, the shortest distance path between $\vec{p}$ and $\vec{q}$ is the line $\vec{p} + t(\vec{q} - \vec{p})$ because:

   a) No matter the geometry, we must head in the direction from $\vec{p}$ to $\vec{q}$ to achieve the shortest path

   b) The length of the line $= \int_a^b \alpha'(t) \cdot \frac{\vec{q}-\vec{p}}{|\vec{q}-\vec{p}|} dt \leq \int_a^b |\alpha'(t)||\frac{\vec{q}-\vec{p}}{|\vec{q}-\vec{p}|}|dt = \int_a^b |\alpha'(t)|dt$

   c) Both of the above

   d) None of the above

4. The dot product of two vectors, $\vec{v} \cdot \vec{w}$ is

   a) $|\vec{v}||\vec{w}|cos(\theta)$ where θ is the angle between them

   b) $|\vec{v}||\vec{w}|sin(\theta)$

   c) $v_1w_1 + v_2w_2 + v_3w_3$, where v_i is the ith entry of $\vec{v}$

   d) all of the above

   e) two of the above

5. To calculate a tangent vector and the velocity vector

   a) If they are parametrized by time then it is the same calculation

   b) They are always equal

   c) For tangent take the component derivatives with respect to the parameter in the parametrization, for velocity take the component derivatives with respect to time

   d) two of the above

   e) none of the above