Discussion Problems, Vector Valued Functions I

(1) Find the acceleration at time 3 of the vector valued function

$$\vec{r}(t) = \langle 1 + \sin t, \sin t, 1 \rangle$$

(2) Find the velocity vectors and positions where these two vector valued functions intersect:

$$\vec{r}(t) = \langle 1 + t, t + 2, 2t^2 + 1 \rangle$$
$$\vec{s}(t) = \langle 3 + t, t^2 + 2, t + 4 \rangle$$

(3) Find the plane which contains both the velocity vector to $\vec{r}(t)$ and the velocity vector to $\vec{s}(t)$ at their point of intersection.

(4) Show that the function

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

does not intersect the plane

$$-2x + 3y + z = 1.$$

Then find the closest point of the vector valued function to the plane by two methods:

- Finding where the velocity of $\vec{r}(t)$ is parallel to the plane
- Taking the distance function between a point and the plane, and minimizing it.

Are these two always going to be the same?