Quiz 1

Be sure to follow the quiz instructions in order to avoid a deduction in points. Submissions are due in Gradescope by 11:59pm on Friday; no late work is accepted.

Name:

Question #1: Consider a particle traveling along the space curve $\mathbf{r}(t) = \langle \cos(2t), \sin(2t), t \rangle$ for $t \in [0, 2\pi]$. [AJN]

(a) Find the speed of the particle one quarter of the way through it's journey, at time $t = \pi/2$.

(b) Find a unit vector which points in the direction of travel at time $t = \pi/4$.

(c) Find the position of the particle halfway through the journey, at time $t = \pi$.

(d) Find a vector equation for the tangent line at time $t = \pi$.

(a)

(b)

(c)

(d)

Question #2: Solve the following initial value problem. A rocket follows a trajectory with velocity vector given by $\mathbf{v}(t) = \langle 3\sin t, 6e^{2t}, 3t^2 \rangle$, with $t \geq 0$. If the launch pad has coordinates $\mathbf{r}(0) = \langle 5, 4, 1 \rangle$ then find a parametrization $\mathbf{r}(t)$ for the flight path of the rocket. [AJN]

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Question #3: Find the coordinates of the point which is a distance of 6 along the helix $\mathbf{r}(t) = \langle \frac{1}{2}t^2, \frac{4}{3}t^{3/2}, 2t \rangle$, $t \geq 0$, in the direction of increasing parameter t from $(0, 0, 0)$.
Hint: find the arc-length parameter $s(t) = \int_{t_0}^{t} |\mathbf{r}'(\tau)|\, d\tau$ *for a good choice of* t_0. [AJN]