

Math 2551-G Quiz 2

QUIZ KEY

You have 10 minutes to take the Quiz. You may not use aids of any kind.

Learning Targets

G2: Calculus of Curves. I can compute tangent vectors to parametric curves and their velocity, speed, and acceleration. I can find equations of tangent lines to parametric curves. I can solve initial value problems for motion on parametric curves.

Tasks

1. Answer the True/False questions below by writing **T** or **F** in the box. Answer the Fill-In question by writing the missing item into the box. You must get three of them correct to receive a **Success**.

- (a) **True/False:** If a particle's acceleration vector is zero, then its velocity vector is constant.

T

- (b) **True/False:** Two curves passing through the same point in space at the same time must have the same tangent vector at that time.

F

- (c) **True/False:** A particle moving at constant speed must have zero acceleration.

F

- (d) **Fill-In:** If $\mathbf{r}(t)$ is the position of a flying saucer at time t , then $\mathbf{r}'(2)$ is a _____ for the tangent line to the path of the flying saucer at time $t = 2$.

direction vector

Quiz continues on the back

Math 2551-G Quiz 2

2. Solve the initial-value problem

$$\mathbf{r}'(t) = \langle \sin(3t), \cos(4t), 2t \rangle, \quad \mathbf{r}(0) = \langle 2, 3, 1 \rangle.$$

Solution. We have

$$\begin{aligned} \mathbf{r}(t) &= \langle 2, 3, 1 \rangle + \int_0^t \langle \sin(3u), \cos(4u), 2u \rangle du \\ &= \langle 2, 3, 1 \rangle + \left\langle -\frac{1}{3} \cos(3u), \frac{1}{4} \sin(4u), u^2 \right\rangle \Big|_0^t \\ &= \langle 2, 3, 1 \rangle + \left\langle -\frac{1}{3} \cos(3t) + \frac{1}{3}, \frac{1}{4} \sin(4t), t^2 \right\rangle \\ &= \left\langle \frac{7}{3} - \frac{1}{3} \cos(3t), 3 + \frac{1}{4} \sin(4t), 1 + t^2 \right\rangle \end{aligned}$$