

Quiz 3

MATH 261, CALCULUS III, SPRING 2018

SECTION:

NAME:

Instructions: Solve as many of these problems as you can. Circle the correct answer, and show your work!

Problem 1. The unit tangent vector to the curve $r(t) = \langle \cos t, \sin 3t, e^t \rangle$ at the point $(1, 0, 1)$ is:

- (a) $\langle 0, \frac{3}{\sqrt{10}}, \frac{1}{\sqrt{10}} \rangle$
- (b) $\langle 0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \rangle$
- (c) $\langle 0, -\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}} \rangle$
- (d) $\langle 0, -\frac{1}{\sqrt{2}}, 0, \frac{1}{\sqrt{2}} \rangle$
- (e) $\langle \frac{-\sqrt{3}}{10}, 0, \frac{1}{10} \rangle$

Problem 2. Find the point P on the curve $r(t) = t\vec{i} + t^2\vec{j} + t^3\vec{k}$ at which the tangent vector is parallel to the vector $\langle 2, 4, 6 \rangle$. The coordinates of P are:

- (a) $(1, 1, 1)$
- (b) $(2, 4, 12)$
- (c) $(1, 2, 3)$
- (d) $(1, 1, -1)$
- (e) $(0, 0, 0)$.

Problem 3 Find the equations of the line that passes through the point $(1, 2, 1)$ and that is parallel to the vector tangent to the curve $r(t) = \langle t^2 + 3t + 2, e^t \cos t, \ln(t + 1) \rangle$ at $(2, 1, 0)$.

- (a) $x = 1 + 3t, y = 2 + t, z = 1 + t$
- (b) $x = 3 + 2t, y = e^t(\cos t - \sin t), z = \frac{1}{1+t}$
- (c) $x = 1 + 2t, y = 2 + t, z = 1$
- (d) $x = 2 + 3t, y = 1 + t, z = t$
- (e) $x = 2 + 3t, y = 1 + 2t, z = -3t$.

Problem 4 Suppose the trajectories of two particles are given by $r_1(t) = \langle t+1, 2t^{1/2}, 2^{1/2}t \rangle$ and $r_2(t) = \langle 2t, t^2 + 1, t^2 - 2t + 2^{1/2} + 1 \rangle$. Find the angle between their tangent vectors at their point of collision.

- (a) 0
- (b) $\pi/6$
- (c) $\pi/4$
- (d) $\pi/3$
- (e) $\pi/2$.