

"QUIZ" for Lecture 5

NAME: (print!) SAI EMBAR

Section: 23

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q5FirstLast.pdf) ASAP BUT NO LATER THAN Sept. 21, 8:00pm

1, Find the curvature for

$$r(t) = \sin t \mathbf{i} + \cos t \mathbf{j} + t \mathbf{k} .$$

$$r'(t) = \cos t \mathbf{i} - \sin t \mathbf{j} + \mathbf{k} , \quad |r'(t)| = \sqrt{\cos^2(t) + \sin^2(t) + 1} = \sqrt{2}$$

$$r''(t) = -\sin t \mathbf{i} - \cos t \mathbf{j}$$

$$r'(t) \times r''(t) = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ \cos t & -\sin t & 1 \\ -\sin t & -\cos t & 0 \end{vmatrix} = \cos(t) \mathbf{i} - \sin(t) \mathbf{j} + (\cos^2(t) - \sin^2(t)) \mathbf{k}$$

$$= \|r'(t) \times r''(t)\| = \sqrt{(\cos t)^2 + (-\sin t)^2 + (-1)^2} = \sqrt{2}$$

$$k = \frac{\|r'(t) \times r''(t)\|}{\|r'(t)\|^3} = \frac{\sqrt{2}}{2\sqrt{2}} = \boxed{\frac{1}{2}}$$

2.: Find the velocity, acceleration, and speed of a particle with the given position function.

$$r(t) = t \mathbf{i} + t^2 \mathbf{j} + 5 \mathbf{k} .$$

$$v(t) = r'(t)$$

velocity: $v(t) = 1\mathbf{i} + 2t\mathbf{j} + 0\mathbf{k} = \langle 1, 2t, 0 \rangle$

acceleration

$$a(t) = v'(t)$$

$$a(t) = 0\mathbf{i} + 2\mathbf{j} + 0\mathbf{k} = \langle 0, 2, 0 \rangle$$

speed,

$$\|v(t)\| = \sqrt{1^2 + (2t)^2} = \sqrt{1 + 4t^2}$$