

"QUIZ" for Lecture 5

NAME: (print!) Gillian Mulvey Section: _____

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

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

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

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

$$-1(\cos^2 t + \sin^2 t)$$

$$-1 \cdot 1$$

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

$$= (\cos^2 t, -\sin^2 t, -1)$$

$$K = \frac{|r'(t) \times r''(t)|}{|r'(t)|^3} = \frac{\sqrt{\cos^2 t + \sin^2 t + (-1)^2}}{(\sqrt{\cos^2 t + \sin^2 t + 1})^3} = \frac{\sqrt{1 + (-1)^2}}{(\sqrt{1 + 1})^3} = \frac{\sqrt{2}}{2\sqrt{2}} = \frac{1}{2}$$

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

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

$$r'(t) = \mathbf{i} + 2t \mathbf{j} + 0 \mathbf{k}$$

$$\text{speed} = \sqrt{(1^2) + (2t)^2}$$

$$v(t) = \mathbf{i} + 2t \mathbf{j}$$

$$\text{speed} = \sqrt{1 + 4t^2}$$

$$a(t) = 2 \mathbf{j}$$