

"QUIZ" for Lecture 5

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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

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

$$r'(t) = \langle \cos t, -\sin t, 1 \rangle = \langle \sin t, \cos t, t \rangle \quad |r'(t)| = \sqrt{1+t^2}$$

$$r''(t) = \langle -\sin t, -\cos t, 0 \rangle$$

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

$$= \cos t \mathbf{i} + \sin t \mathbf{j} - \mathbf{k}$$

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

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

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

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

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

$$a(t) = r''(t) = 2 \mathbf{j}$$

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

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

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