

"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

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

$$\frac{|r'(t) \times r''(t)|}{|r'(t)|^3}$$

$$\rightarrow r(t) = \langle \sin(t), \cos(t), t \rangle$$

$$\rightarrow r'(t) = \langle \cos(t), -\sin(t), 1 \rangle$$

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

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

$$\rightarrow |-\cos t \mathbf{i} - \sin t \mathbf{j} - \mathbf{k}| = |\langle -\cos t, -\sin t, -1 \rangle| = \sqrt{\cos^2 t + \sin^2 t + 1} = \sqrt{2}$$

$$\rightarrow |\langle \cos(t), -\sin(t), 1 \rangle|^3 = (\sqrt{\cos^2 t + \sin^2 t + 1})^3 = (\sqrt{2})^3 = 2\sqrt{2} \rightarrow \frac{\sqrt{2}}{2\sqrt{2}} \rightarrow \text{Ans: } \frac{1}{2}$$

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

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

$$\rightarrow v(t) = r'(t) = \langle 1, 2t, 0 \rangle$$

$$\rightarrow v(t) = \mathbf{i} + 2t \mathbf{j} \leftarrow \text{velocity}$$

$$\rightarrow a(t) = r''(t) = \langle 0, 2, 0 \rangle$$

$$\rightarrow a(t) = 2 \mathbf{j} \leftarrow \text{acceleration}$$

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

$$\rightarrow s(t) = \sqrt{1 + 4t^2} \leftarrow \text{speed}$$