

"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

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

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

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

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

$$|\mathbf{r}'(t) \times \mathbf{r}''(t)| = \sqrt{2}$$

$$k = \frac{\sqrt{2}}{2\sqrt{2}} = \boxed{\frac{1}{2}}$$

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

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

$$\mathbf{v}(t) = \mathbf{r}'(t)$$

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

$$\mathbf{a}(t) = \mathbf{v}'(t)$$

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

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