

"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

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

1, Find the curvature for

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

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

$$|r'(t) \times r''(t)| = \left| \det \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \cos t & -\sin t & 1 \\ -\sin t & -\cos t & 0 \end{vmatrix} \right| = \sqrt{(\cos^2(t) + \sin^2(t)) + (-\cos^2(t) - (\sin^2 t))^2}$$

$$\downarrow \qquad \qquad \qquad + (-1)^2$$

$$\sqrt{1 + 1} = \boxed{\sqrt{2}}$$

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

$$= (\sqrt{2})^3 = \boxed{2\sqrt{2}}$$

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

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

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

$$v(t) = r'(t) = 1\hat{i} + 2t\hat{j} \quad s(t) = |v(t)| = \sqrt{1^2 + 4t^2}$$

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