

9/20/20 Lecture 5 Attendance Quiz.

1) curvature for  $\langle \sin t, \cos t, t \rangle = r(t)$

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

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

$$r'(t) \times r''(t) = \det \begin{pmatrix} i & j & k \\ \cos t & -\sin t & 1 \\ -\sin t & -\cos t & 0 \end{pmatrix}$$

$$\langle \cos t, -\sin t, -(\cos^2 t + \sin^2 t) \rangle$$

$$= \langle \cos t, -\sin t, -1 \rangle$$

$$\hookrightarrow \text{Magnitude} = \sqrt{\cos^2 t + \sin^2 t + 1} = \sqrt{2}$$

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

$$\|r'(t)\|^3 = 2\sqrt{2}$$

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

$$2) r(t) = \langle t, t^2, 5 \rangle$$

$$r'(t) = \langle 1, 2t, 0 \rangle \rightarrow \text{velocity}$$

$$r''(t) = \langle 0, 2, 0 \rangle \rightarrow \text{acceleration}$$

$$\text{speed} = \|r'(t)\| = \sqrt{1 + 4t^2}$$