

Problem 7. (10 pts)  $\vec{r}(t) = \langle t \cos t, t \sin t, t^{1/2} \rangle$ , find parametric equations for the tangent line at the point  $(-\pi, 0, \sqrt{\pi})$ .

$$\dot{\vec{r}}(t) = \left\langle \cos t - t \sin t, \sin t + t \cos t, \frac{1}{2\sqrt{t}} \right\rangle$$

$$\vec{r}(t) = \langle -\pi, 0, \sqrt{\pi} \rangle \Rightarrow \begin{cases} t \cos t = -\pi \\ t \sin t = 0 \\ \sqrt{t} = \sqrt{\pi} \end{cases} \Rightarrow t = \pi$$

$$\dot{\vec{r}}(\pi) = \left\langle -1, -\pi, \frac{1}{2\sqrt{\pi}} \right\rangle$$

TANGENT LINE: 
$$\begin{cases} x = -\pi - s \\ y = -\pi s \\ z = \sqrt{\pi} + \frac{1}{2\sqrt{\pi}} s \end{cases} \quad (s \in \mathbb{R})$$