11. $\vec{r}(t) = \cos^5(t)\,\vec{i} + \sin^3(t)\,\vec{j}$

$(\cos t)^5$

$5(\cos t)^4 \cdot \frac{d}{dt}(\cos t)$

$\vec{r}\,'(t) = 5\cos^4(t)(-\sin t)\,\vec{i} + 3\sin^2(t)\cos t\,\vec{j}$

$-5\cos^4(t)\sin t = 0$ $\quad$ $3\sin^2(t)\cos t = 0$

$\cos^4(t) = 0$ $\quad \sin t = 0$ $\quad$ $\sin^2(t) = 0$ $\quad \cos t = 0$

$\cos t = 0$ $\quad \sin t = 0$ $\quad$ $\sin t = 0$ $\quad \cos t = 0$

$t = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi \ldots$ $\quad$ $t = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi \ldots$

NOT SMOOTH AT $\frac{0\pi}{2}, \frac{1\pi}{2}, \frac{2\pi}{2}, \frac{3\pi}{2}, \frac{4\pi}{2}$

SMOOTH: $\left(\frac{n\pi}{2}, \frac{(n+1)\pi}{2}\right)$ n IS INTEGER

NOT SMOOTH AT $t = \frac{n\pi}{2}$, n IS INTEGER

12. $\vec{r}(t) = \frac{1}{e-t}\,\vec{i} + t^2\,\vec{j} + t\,\vec{k}$

$= (e-t)^{-1}\,\vec{i} + t^2\,\vec{j} + t\,\vec{k}$

$\vec{r}\,'(t) = -1(e-t)^{-2}\cdot(-1)\,\vec{i} + 2t\,\vec{j} + 1\,\vec{k}$

$= \frac{1}{(e-t)^2}\,\vec{i} + 2t\,\vec{j} + \vec{k}$

$(e-t)^2 \neq 0$

$0 \neq e-t$

$t - e \neq 0$

$\longrightarrow$ DISC: $t = e$

SMOOTH

$(-\infty, e) \cup (e, \infty)$

$\frac{1}{(e-t)^2} = 0$ $\quad 2t = 0$ $\quad 1 = 0$

$-1 \neq 0$ $\quad t = 0$ $\quad 1 \neq 0$