Thursday Practice 3	Name:	
MATH 241 (Spring 2023)	Section:	0112 (8AM-9AM) / 0122 (9:30AM-10:20AM)
02/16/2023	TA:	Shin Eui Song

Recall the following definition of smooth parametrization. A vector-valued function r (on a interval I) is **smooth** if

- (a) r has a continuous derivative (on I),
- (b) $r'(t) \neq 0$ (for interior points in *I*).

Problem 1. Determine whether or not the following parametrization is smooth. Explain your answers.

- (a) $\boldsymbol{r}(t) = t^2 \hat{\boldsymbol{\imath}} + 3t^6 \hat{\boldsymbol{\jmath}} + 6\hat{\boldsymbol{k}}$ for all real numbers t,
- (b) $\boldsymbol{r}(t) = -\cos t \boldsymbol{\hat{\imath}} + 8 \boldsymbol{\hat{\jmath}} + \sin t \boldsymbol{\hat{k}}$ for $0 \le t \le 2\pi$,
- (c) $r(t) = 5t^2 \hat{\imath} + (t^3 3)\hat{\jmath} + \ln t\hat{k}$ for t > 0.

Problem 2.

- (a) Find a parametrization for a line segment from (2, 4, -3) to (-8, 10, 7).
- (b) Find a parametrization for a semi-circle that passes through the second quadrant with end points $(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$ and $(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$ with center at the origin.

Problem 3. Find the arc length of the parametrization

$$\boldsymbol{r}(t) = 2\sin t\boldsymbol{\hat{\imath}} + 2\cos t\boldsymbol{\hat{\jmath}} + 5\boldsymbol{\hat{k}}$$

for $0 \le t \le \pi$.