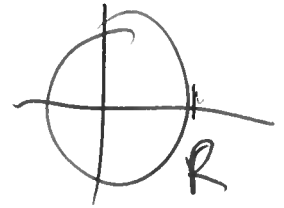


(1)

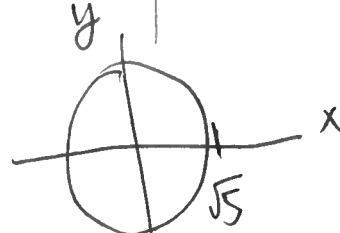
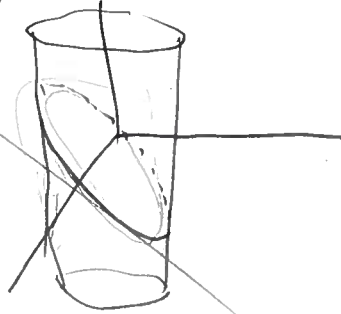
Ex: Parametrize curve of intersection of cylinder $x^2 + y^2 = 5$ and plane

$3x - 2y + z = 4$



$\langle R \cos t, R \sin t \rangle$

Soln:



$\vec{r}(t) = \langle \sqrt{5} \cos(t), \sqrt{5} \sin(t), \dots \rangle$

$z = 4 - 3x + 2y$
 $= 4 - 3\sqrt{5} \cos(t) + 2\sqrt{5} \sin(t)$



Ex: Object follows path

(2)

$$\vec{p}(t) = \langle 8t - 9t^2 + 1, 2t^2 + 3t - 4 \rangle$$

When does it pass thru $(0, 1)$?

~~(0, 1)~~
~~(-5, 23)~~?

(0, 1)

$$8t - 9t^2 + 1 = 0 \rightarrow$$

$$2t^2 + 3t - 4 = 1$$

↓

$$2t^2 + 3t - 5 = 0$$

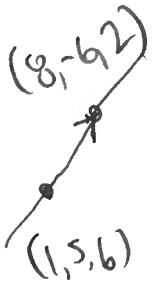
$$t = \frac{-3 \pm \sqrt{9 - 4(2)(-5)}}{4}$$

$$= \frac{-3 \pm \sqrt{49}}{4} = \frac{-3 \pm 7}{4} = \frac{4}{4} \text{ or } \frac{-10}{4}$$

$$t = \frac{-8 \pm \sqrt{64 - 4(-9)(1)}}{-18}$$
$$= \frac{4 \pm \sqrt{100}}{9(-18)}$$
$$= \frac{8 \pm 10}{18} = \frac{18}{18} \text{ and } \frac{-2}{18}$$

Ex: Find ^{vect} eqn of line segment from (1, 5, 6) to (8, -6, 2).

③



Soln:

$$\begin{cases} \vec{r}(t) = t \langle 8, -6, 2 \rangle + (1-t) \langle 1, 5, 6 \rangle \\ 0 \leq t \leq 1 \end{cases}$$

$$\begin{cases} \vec{r}(t) = \langle 8t + (1-t), -6t + 5(1-t), 2t + 6(1-t) \rangle \\ = \langle 7t + 1, -11t + 5, -4t + 6 \rangle \\ 0 \leq t \leq 1 \end{cases}$$

Ex: Parametrize line segment from (1, 5, 6) to (8, -6, 2)

time $t=1$

time $t=2$

$$\begin{cases} \vec{r}(t) = (2-t) \langle 1, 5, 6 \rangle + (t-1) \langle 8, -6, 2 \rangle \\ 1 \leq t \leq 2 \end{cases}$$

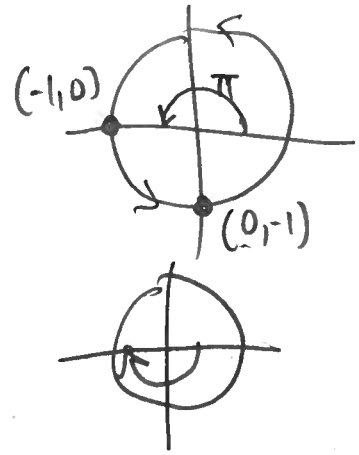
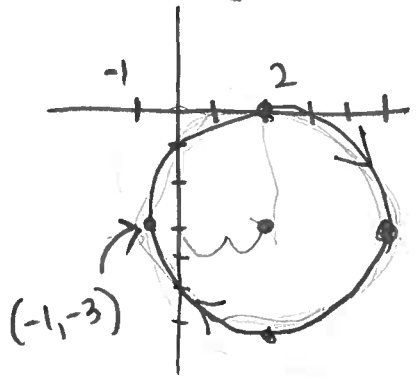
~~$(2-t) \langle 1, 5, 6 \rangle + (t-1) \langle 8, -6, 2 \rangle$~~

$$\begin{cases} \vec{r}(t) = \langle 2-t+8t-8, 10-5t-6t+6, 12-6t+2t-2 \rangle \\ = \langle 7t-6, -11t+16, -4t+10 \rangle \\ 1 \leq t \leq 2 \end{cases}$$

$\frac{12}{22} = \frac{16}{6}$

Ex: Parametrize circle of radius 3
 in xy-plane centered at $(2, -3)$,
 oriented clockwise, with $t=0$ corresponding
 to $(-1, -3)$.

Soln:



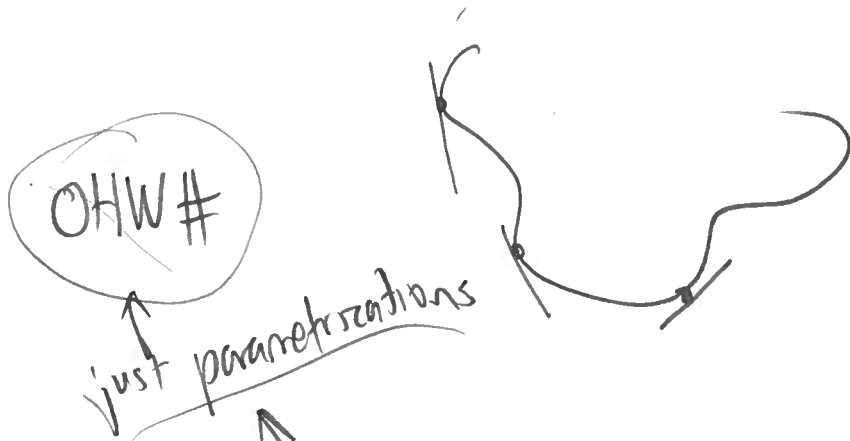
$$\left\{ \begin{array}{l} \vec{r}(t) = \langle 2 + 3\sin(t - \frac{\pi}{2}), -3 + 3\cos(t - \frac{\pi}{2}) \rangle \\ 0 \leq t \leq 2\pi \end{array} \right.$$

EX: Find curve of intersection of $y=f(x)$
paraboloid $z=7x^2+2y^2$ with $\vec{r}(t)=\langle t, f(t) \rangle$

$y=4x^2$ $\rightarrow z=7x^2+2(4x^2)^2$

$$\left\{ \begin{array}{l} \vec{r}(t) = \langle t, 4t^2, 7t^2 + 32t^4 \rangle \\ -\infty < t < \infty \end{array} \right. \quad = 7x^2 + \underbrace{2 \cdot 16x^4}_{32}$$

Tomorrow - calculus of space curves



OHW#

just parametrizations

assign today
due by next wed