1/28/2014

9.7

2D

$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$

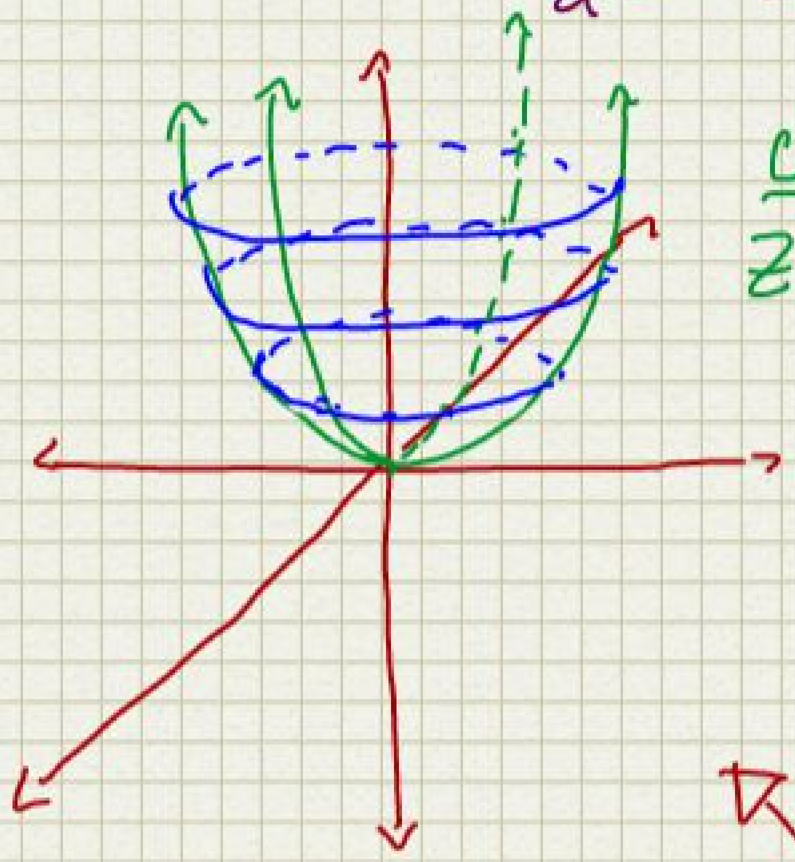
3D Ellipsoid

$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}+\frac{(z-l)^2}{c^2}=1$$

Circular Paraboloid

$z=x^2+y^2$

* a circular parapaloid is a special case of an Elliptical Paraballoid



$$(y-k)=\frac{(x-l)^2}{a^2}$$

Elliptic Paraballoid

$$c(z-l)=\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}$$

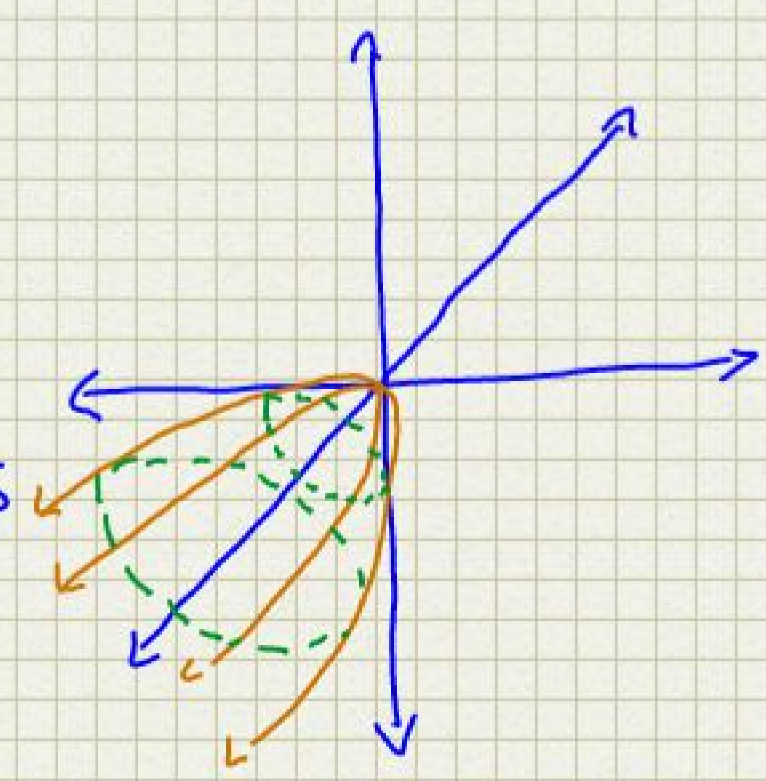
* c - dictates if paraballoid opens up or down

$$z=\frac{x^2}{a^2}+\frac{y^2}{b^2}$$

$$x=\frac{y^2}{2}+\frac{z^2}{4}$$

vertex at (0, 0)

* Eliptic Paraboloid that opens towards x - axis



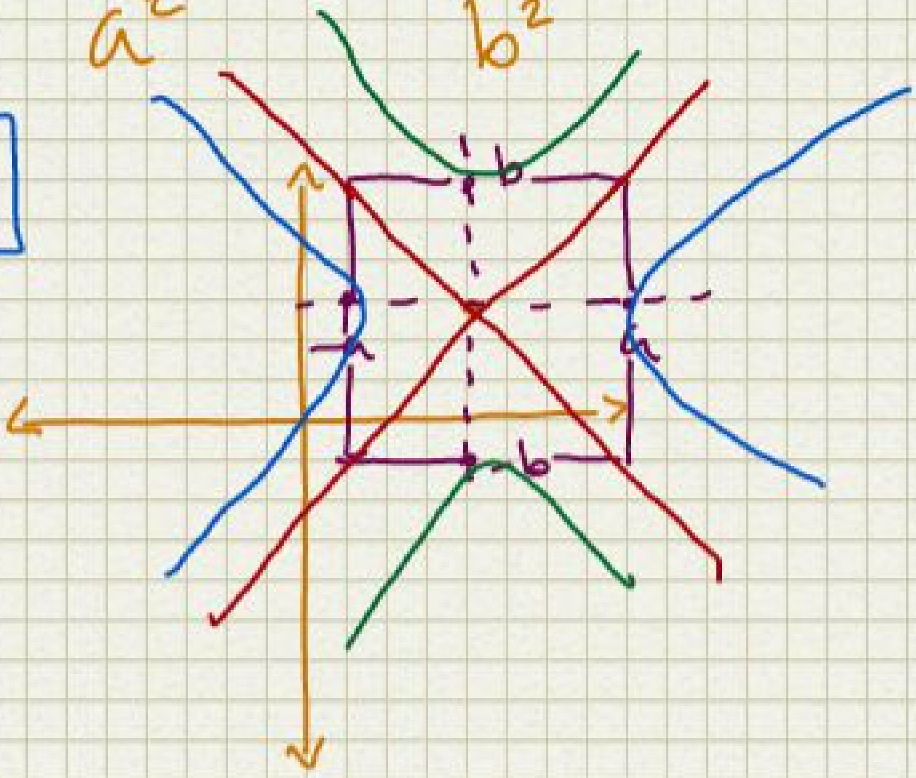
2D

Hyperbola

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = \pm 1$$

$\boxed{+1}$

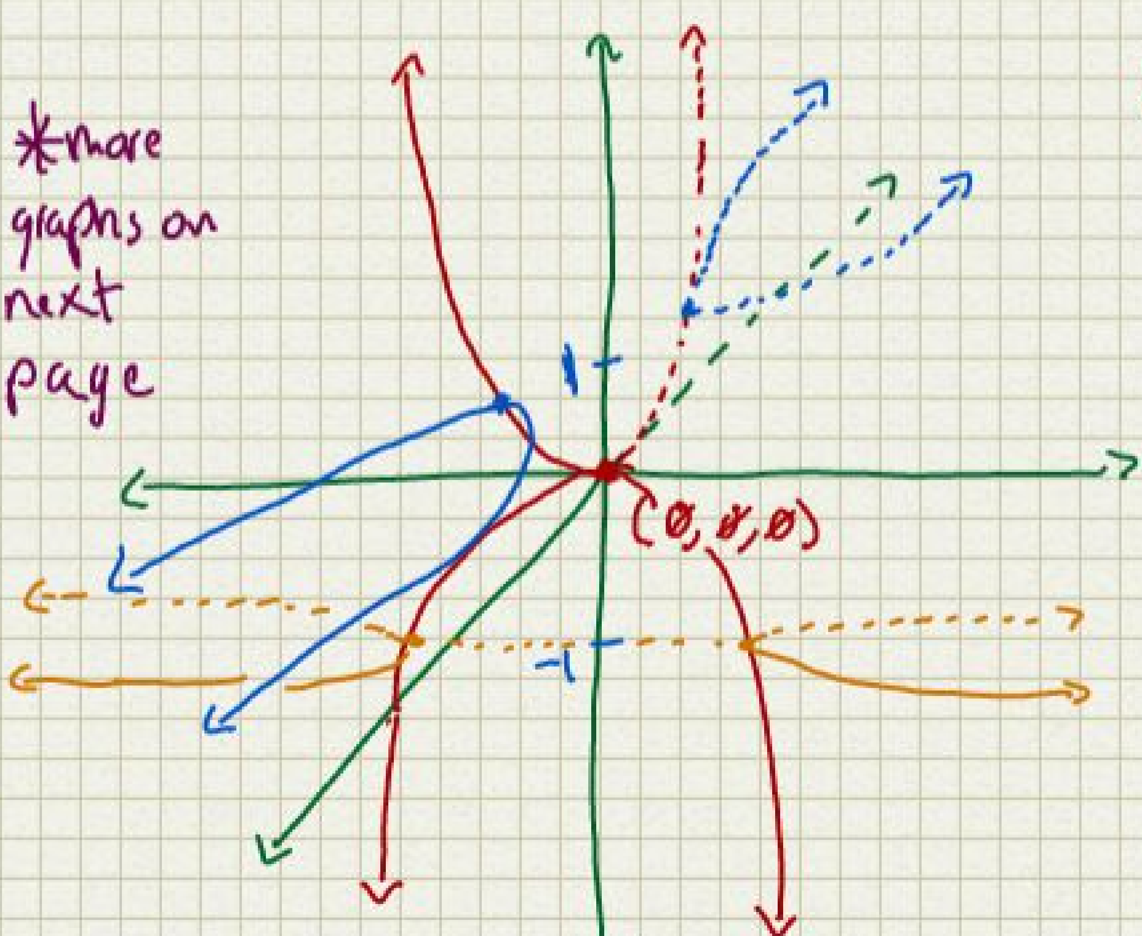
$\boxed{-1}$



3D Hyperbolic Paraboloid

$$c(z-l) = \frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2}$$

*more graphs on next page



$z = x^2 - y^2$

$\begin{cases} z = 0 \\ 0 = x^2 - y^2 \end{cases}$

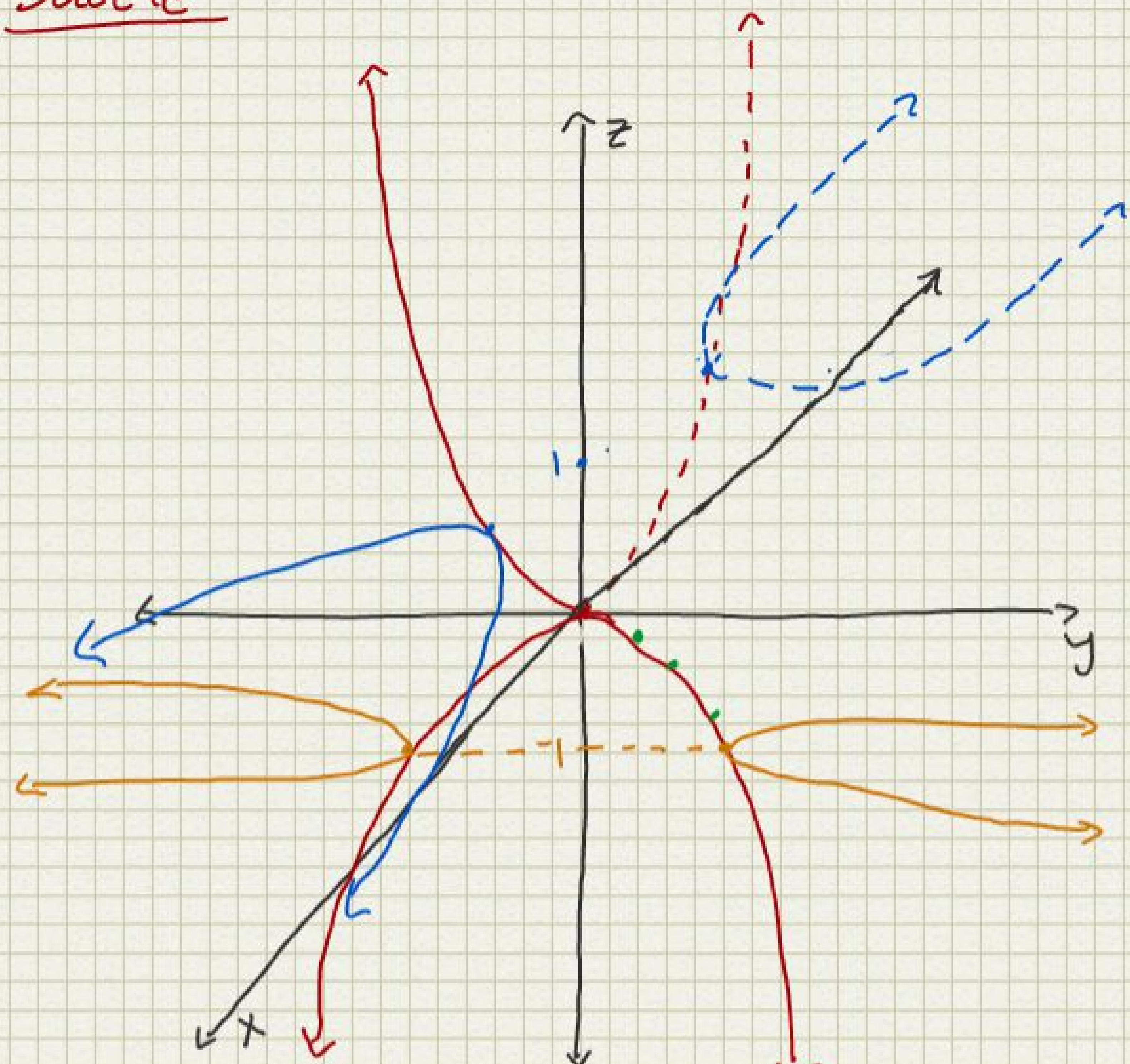
$\begin{cases} x = 0 \\ z = -y^2 \end{cases}$ * on x-z plane

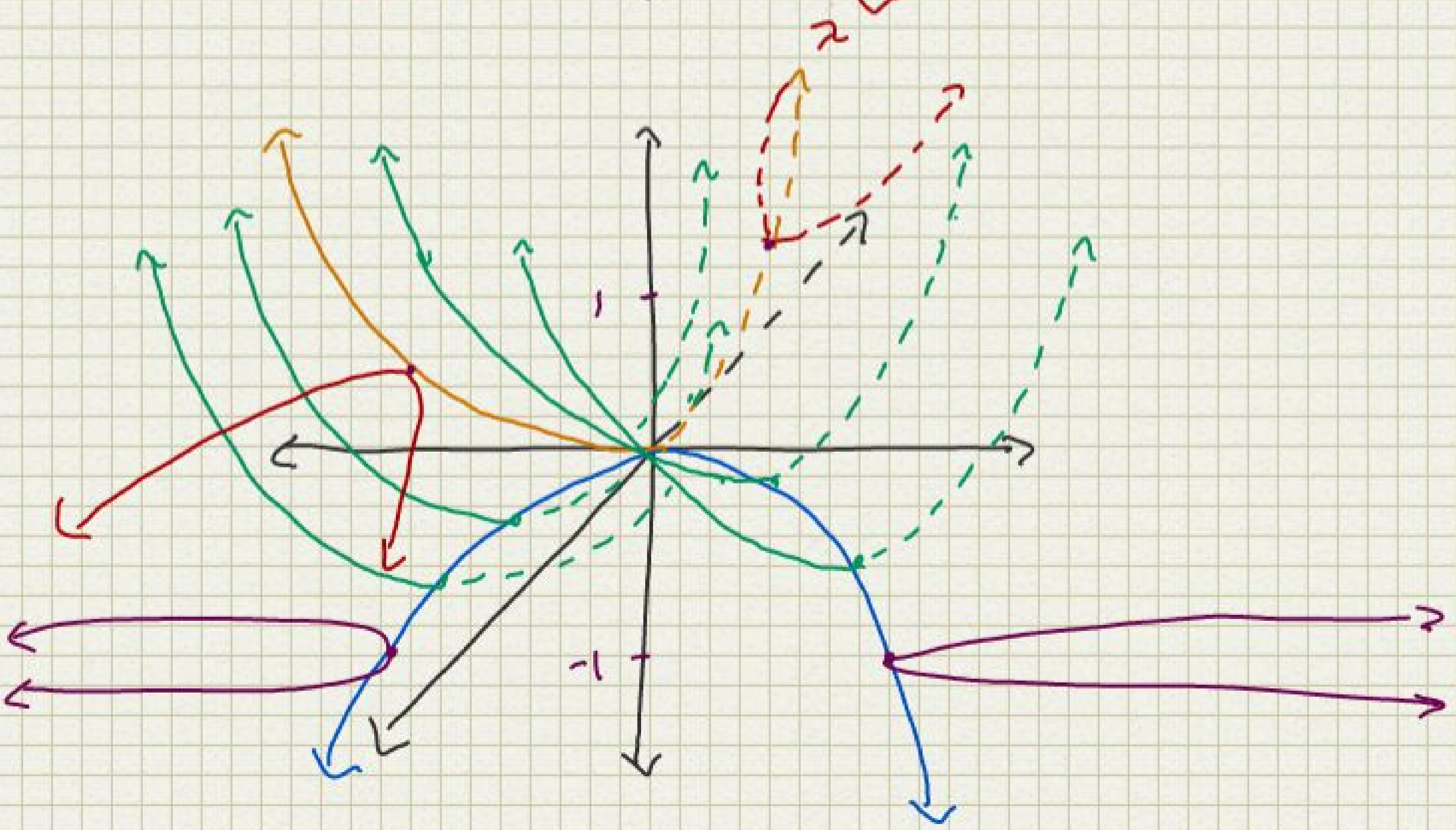
$\begin{cases} y = 0 \\ z = x^2 \end{cases}$ * on y-z plane

$\begin{cases} z = -1 \\ -1 = x^2 - y^2 \end{cases}$

$\begin{cases} z = 1 \\ 1 = x^2 - y^2 \end{cases}$ * intersect parabola @ $z = 1$

Saddle





Eliptic Hyperbaloid

$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}-\frac{(z-l)^2}{c^2}=\pm 1$$

$\boxed{+1}$ one sheet

* all quadratic terms
two w/ same signs, one opposite

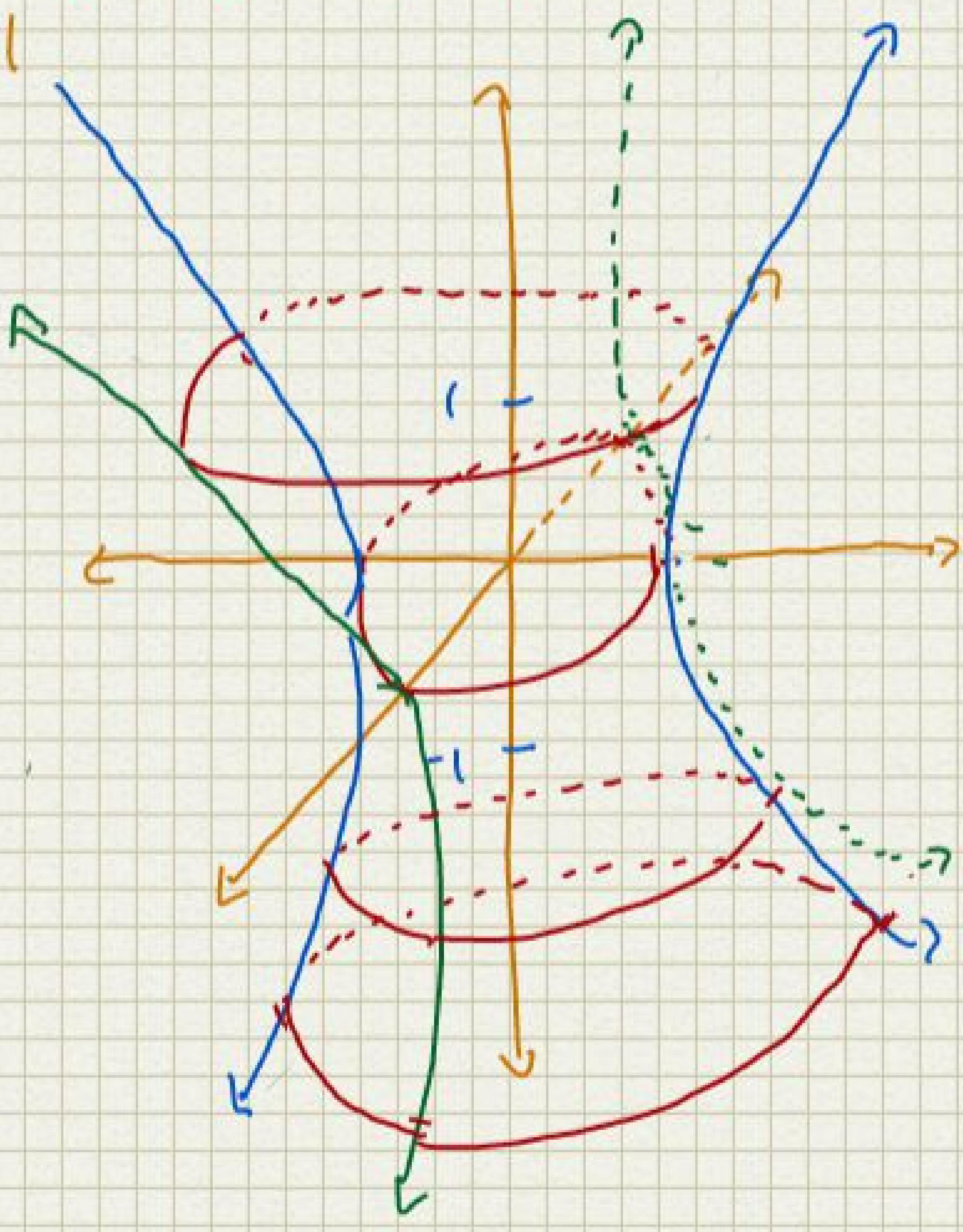
x^2 & y^2 agree w/ right hand side

$x^2+y^2-z^2=1$

$\begin{cases} z=0 \\ x^2+y^2=1 \end{cases}$

$\begin{cases} x=0 \\ y^2-z^2=1 \end{cases}$

$\begin{cases} y=0 \\ x^2-z^2=1 \end{cases}$



2 sheets

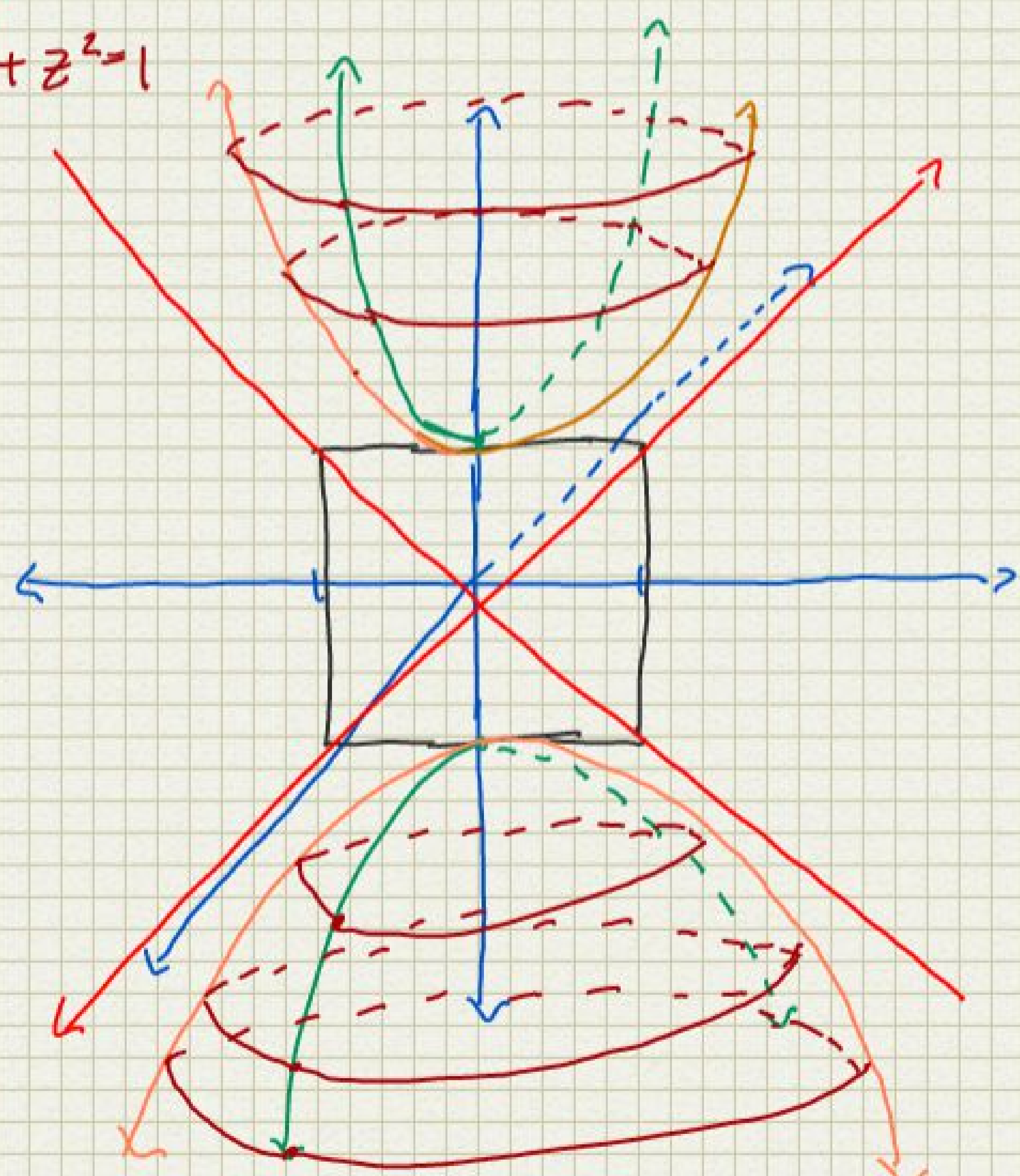
z^2 agrees w/ RHS

$x^2+y^2-z^2=-1$

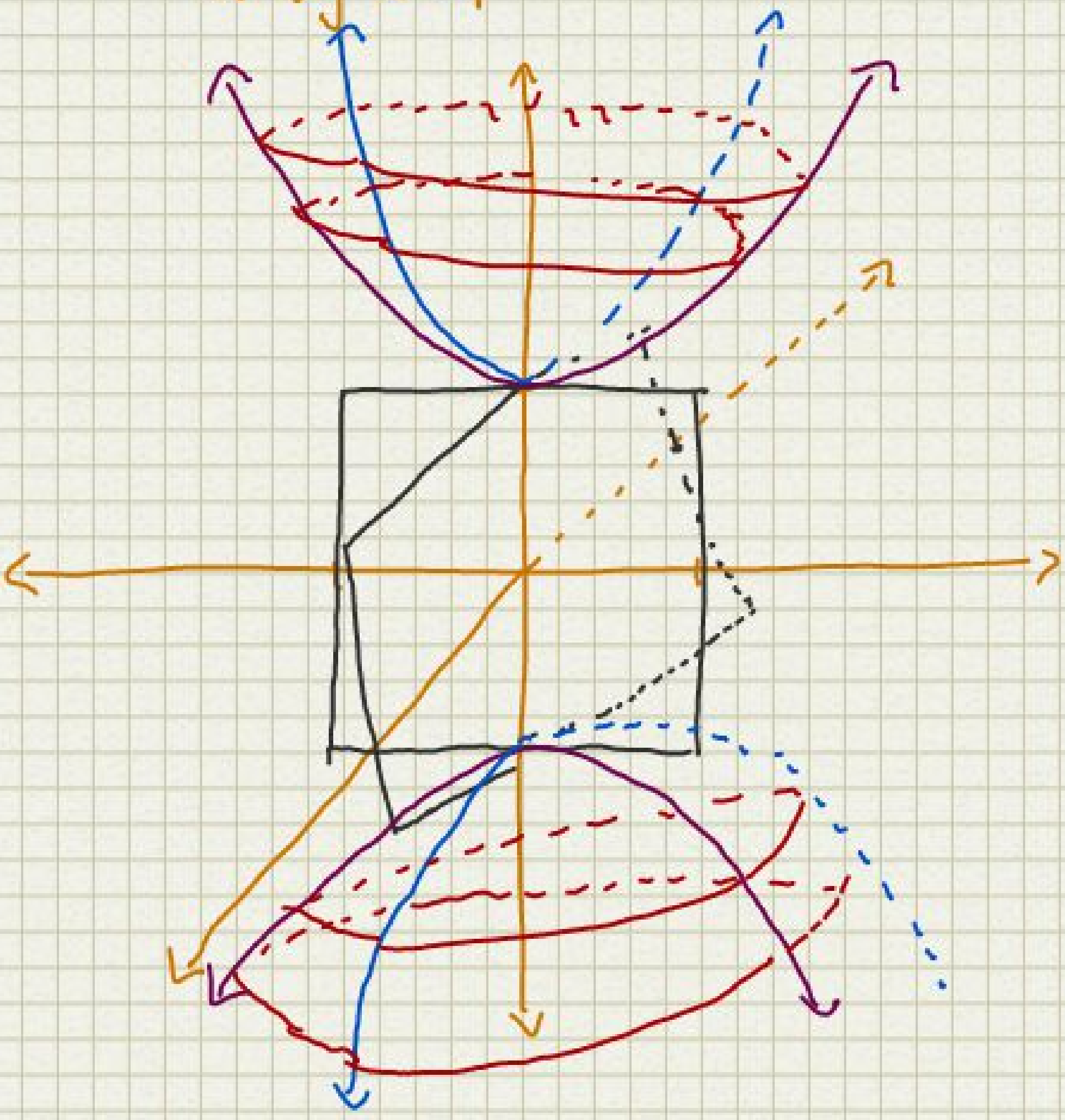
$\begin{cases} \cancel{z=\emptyset} \\ \cancel{-x^2-y^2=1} \end{cases}$ no solution

$\begin{cases} x=\emptyset \\ -y^2+z^2=1 \end{cases}$ (x-z plane)

$\begin{cases} y=\emptyset \\ -x^2+z^2=1 \end{cases}$



$$\begin{cases} z = \pm\sqrt{5} \\ -x^2-y^2+5=1 \\ x^2+y^2=4 \end{cases}$$



$$-x^2-y^2+z^2=\epsilon$$

(zero)

* as ϵ approaches $\emptyset$ the squares (asymptopes) shrink and approach the origin.

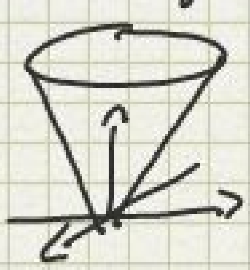
<u>Cone</u>

$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}-\frac{(z-l)^2}{c^2}=\emptyset$$

$$x^2+y^2-z^2=\emptyset$$

$z=\pm\sqrt{x^2+y^2}$

$z=\sqrt{x^2+y^2}$

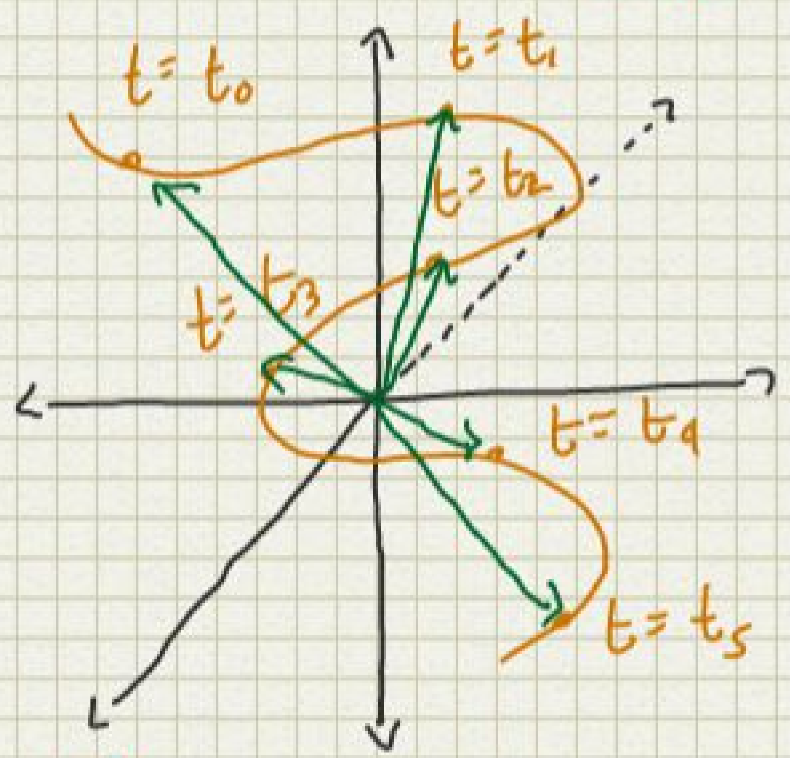


$z=-\sqrt{x^2+y^2}$

10.1

Vector Function

- (Vector valued function)
- F is a rule that associates for all t in the domain D of the function a unique point $\begin{cases} x(t) \\ y(t) \\ z(t) \end{cases}$ in the range of the function.



A V.V.F. is a rule that associates for all t in the domain of the function a unique vector $\vec{R}(t) = \langle x(t), y(t), z(t) \rangle$ in the Range of the function

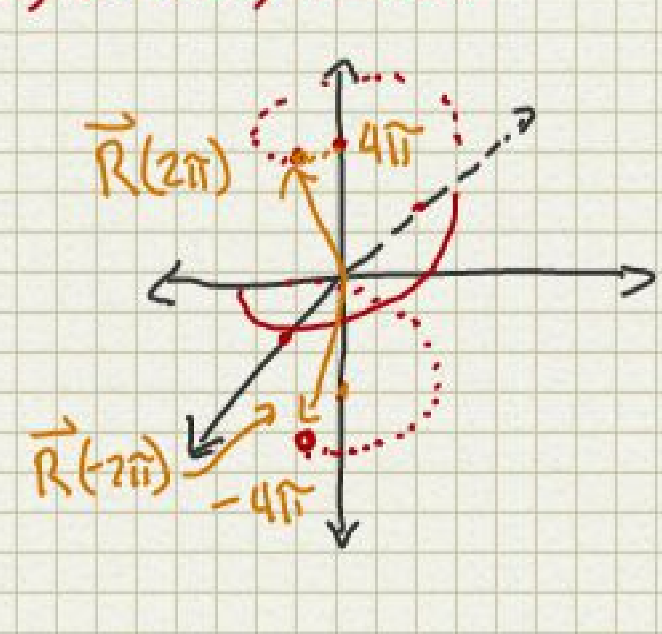
* foot in origin

$\vec{R}(t)$ is the vector that follows the line

Ex. $\vec{R}(t) = \langle \cos(t), \sin(t), z(t) \rangle$

$$\begin{cases} x = \cos(t) \\ y = \sin(t) \\ z = z(t) \end{cases}$$

* helix growing w/ z



$\vec{R}(t)$ $\quad (\vec{R} \pm \vec{q})t = \vec{R}(t) \pm \vec{q}(t)$

$\vec{q}(t)$

$f(t)$ $\quad (f\vec{R})(t) = f(t)\vec{R}(t)$

$$(\vec{R} \cdot \vec{q})(t) = \vec{R}(t) \cdot (\vec{q})(t)$$

$$(\vec{R} \times \vec{q})(t) = \vec{R}(t) \times \vec{q}(t)$$