1/28/2014

9.7

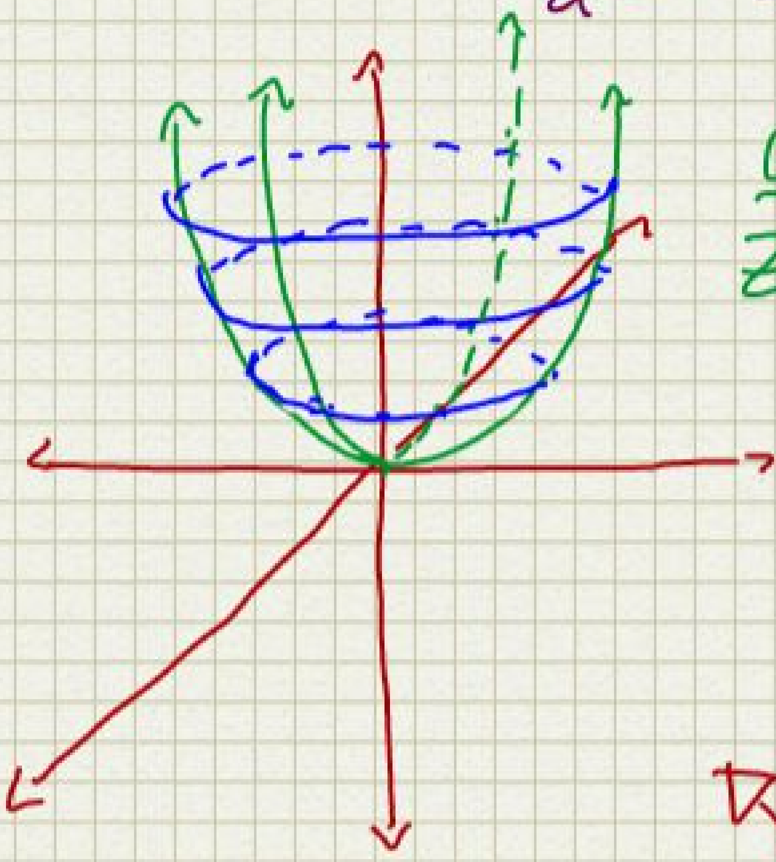
2D

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

3D Ellipsoid

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

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



Circular Parabaloid

$z = x^2 + y^2$

Elliptic Paraballoid

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

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

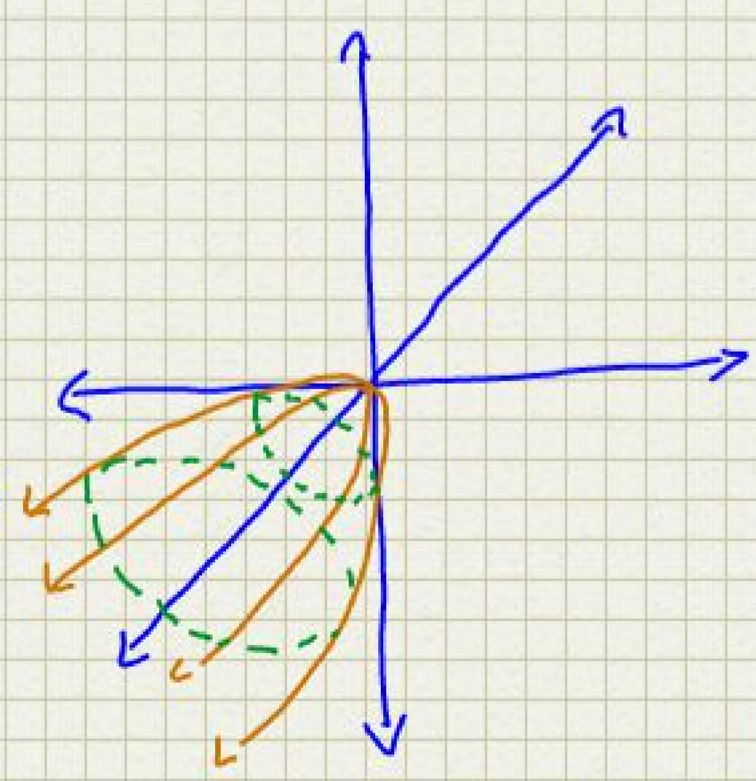
* c - dictates if paraballoid opens up or down

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

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

vertex at (0, 0)

* Eliptic Parabaloid that opens towards x - axis



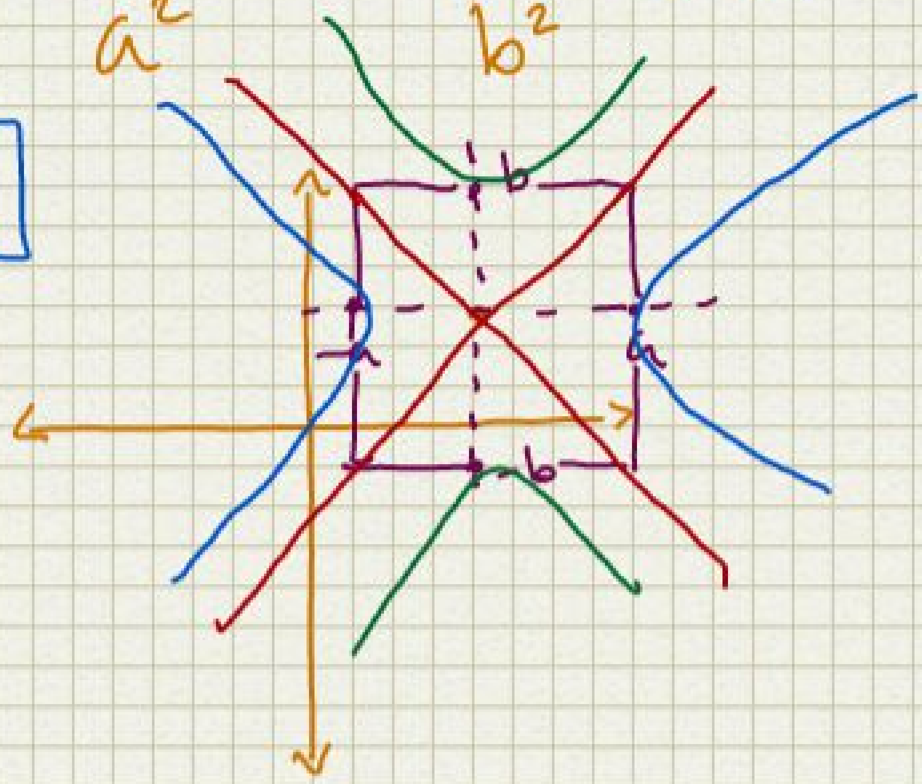
2D

Hyperbola

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

$\boxed{+1}$

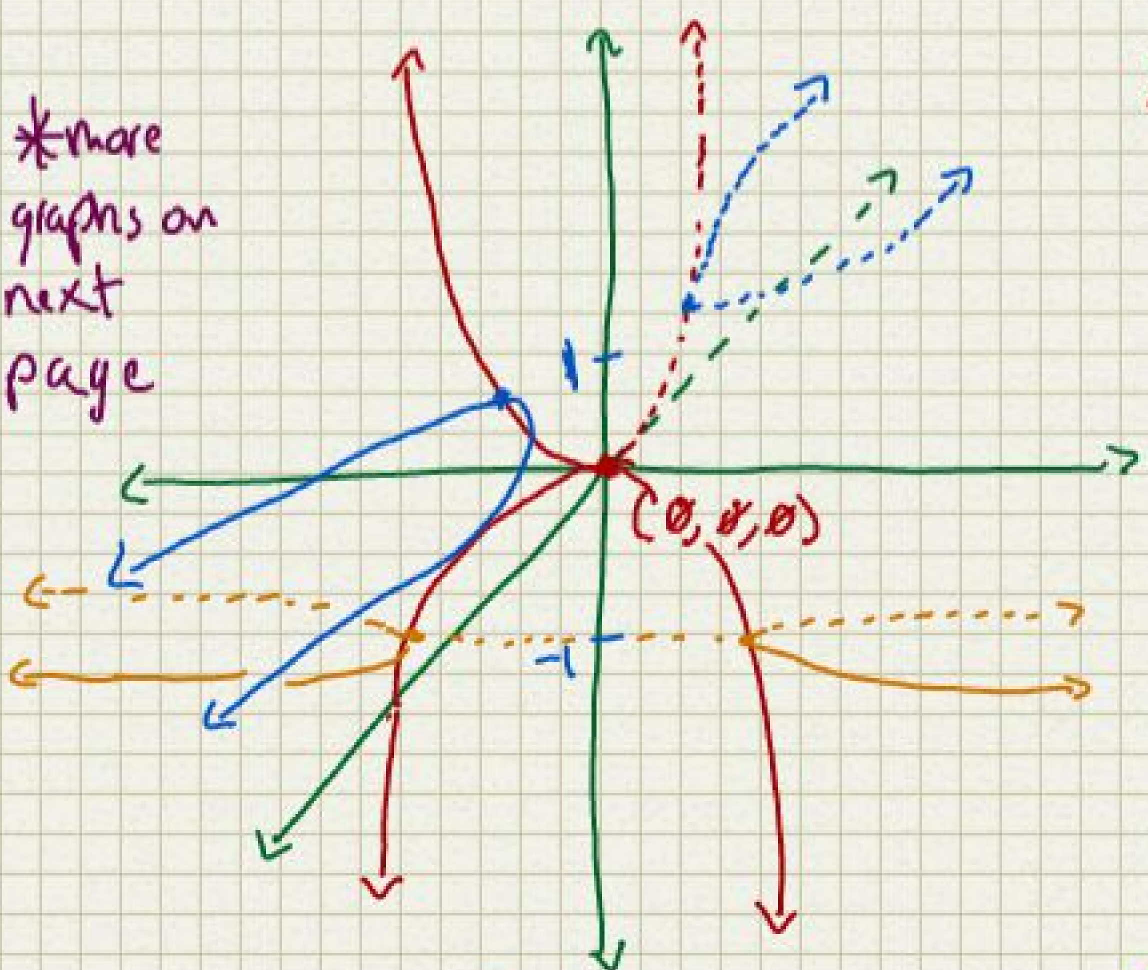
$\boxed{-1}$



3D Hyperbolic Parabaloid

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

*more graphs on next page



$z = x^2 - y^2$

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

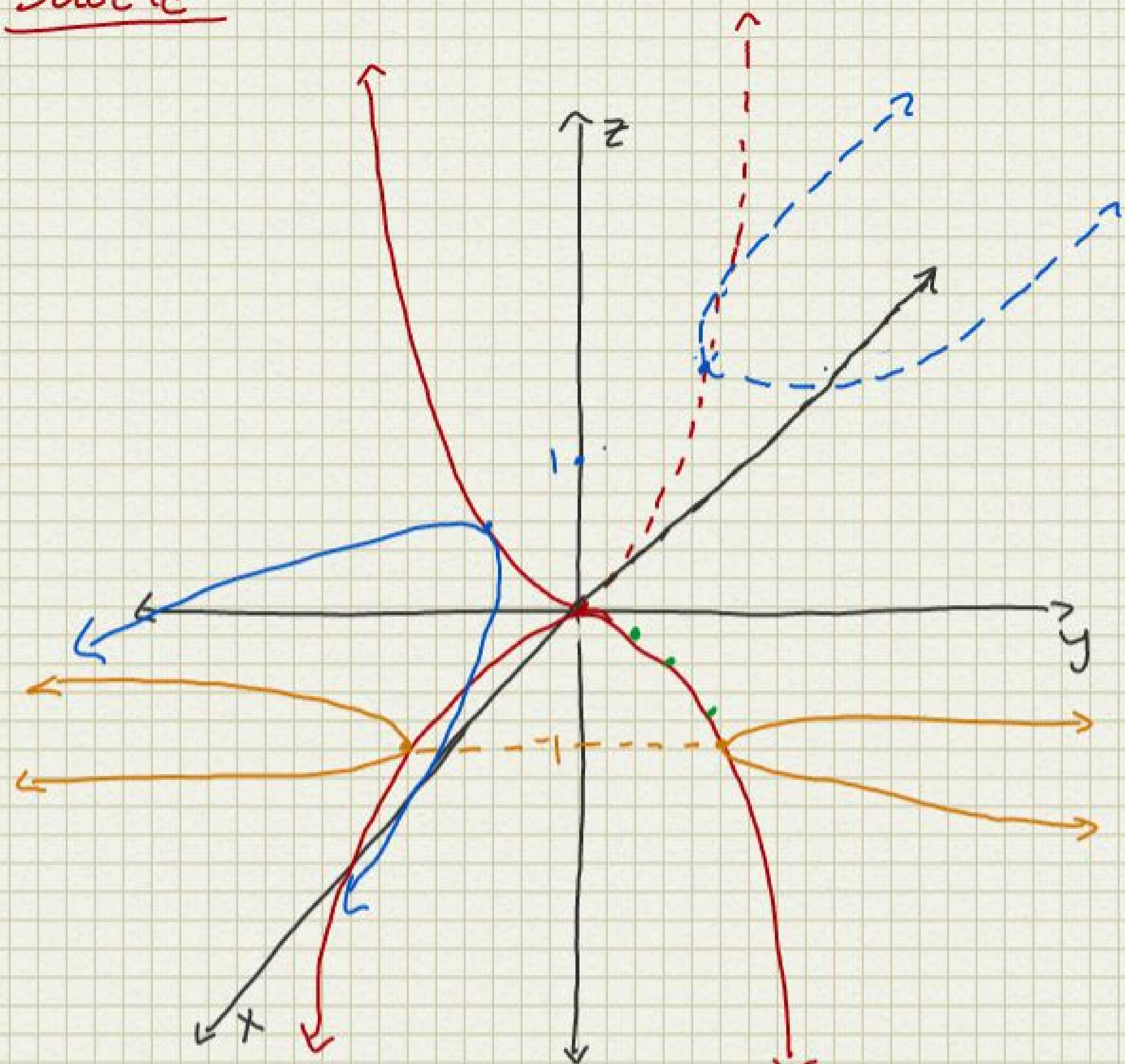
$\begin{cases} x = 0 \\ z = -y^2 \end{cases}$ * on x-z plane

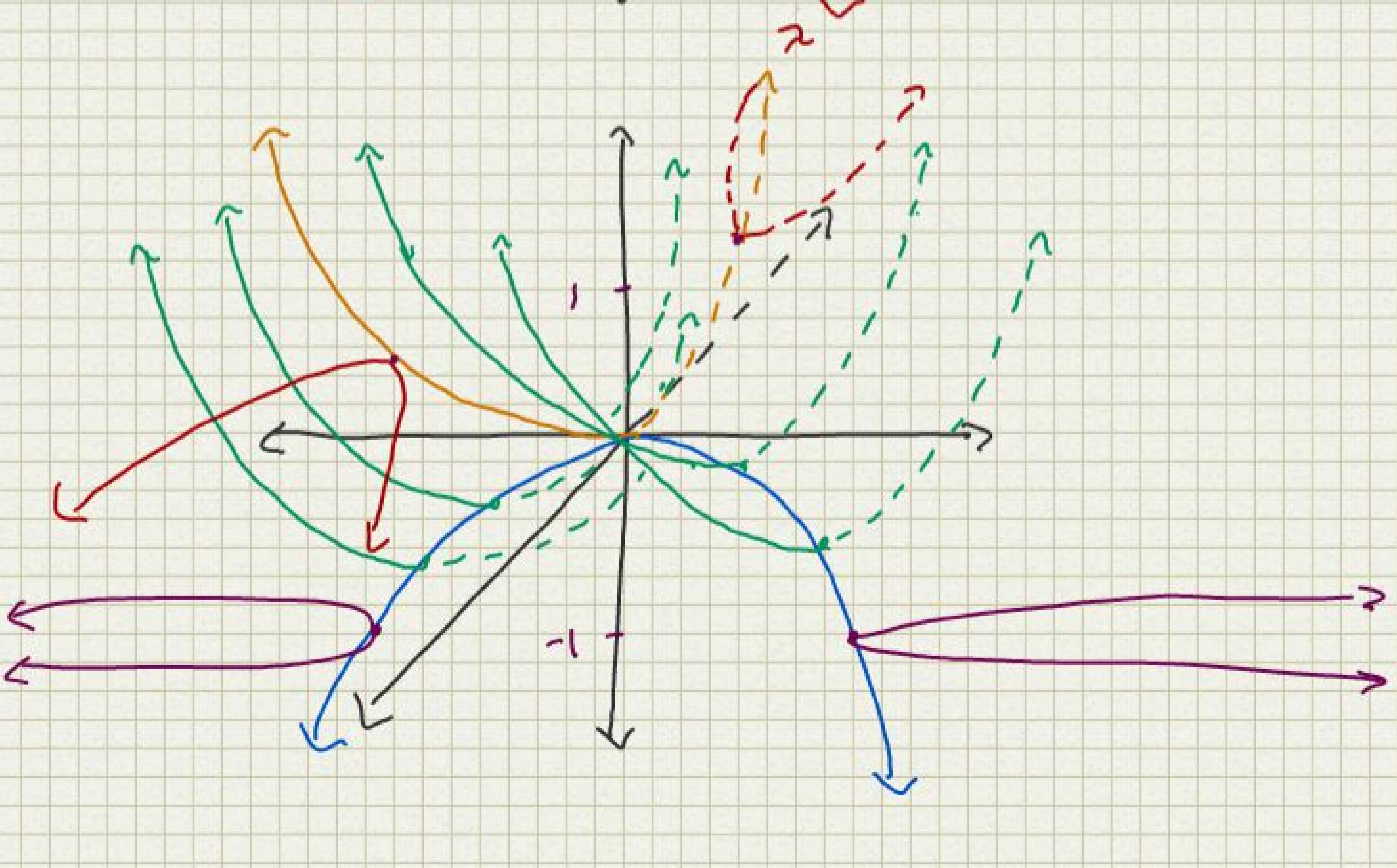
$\begin{cases} y = 0 \\ z = x^2 \end{cases}$ * on y-z plane

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

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

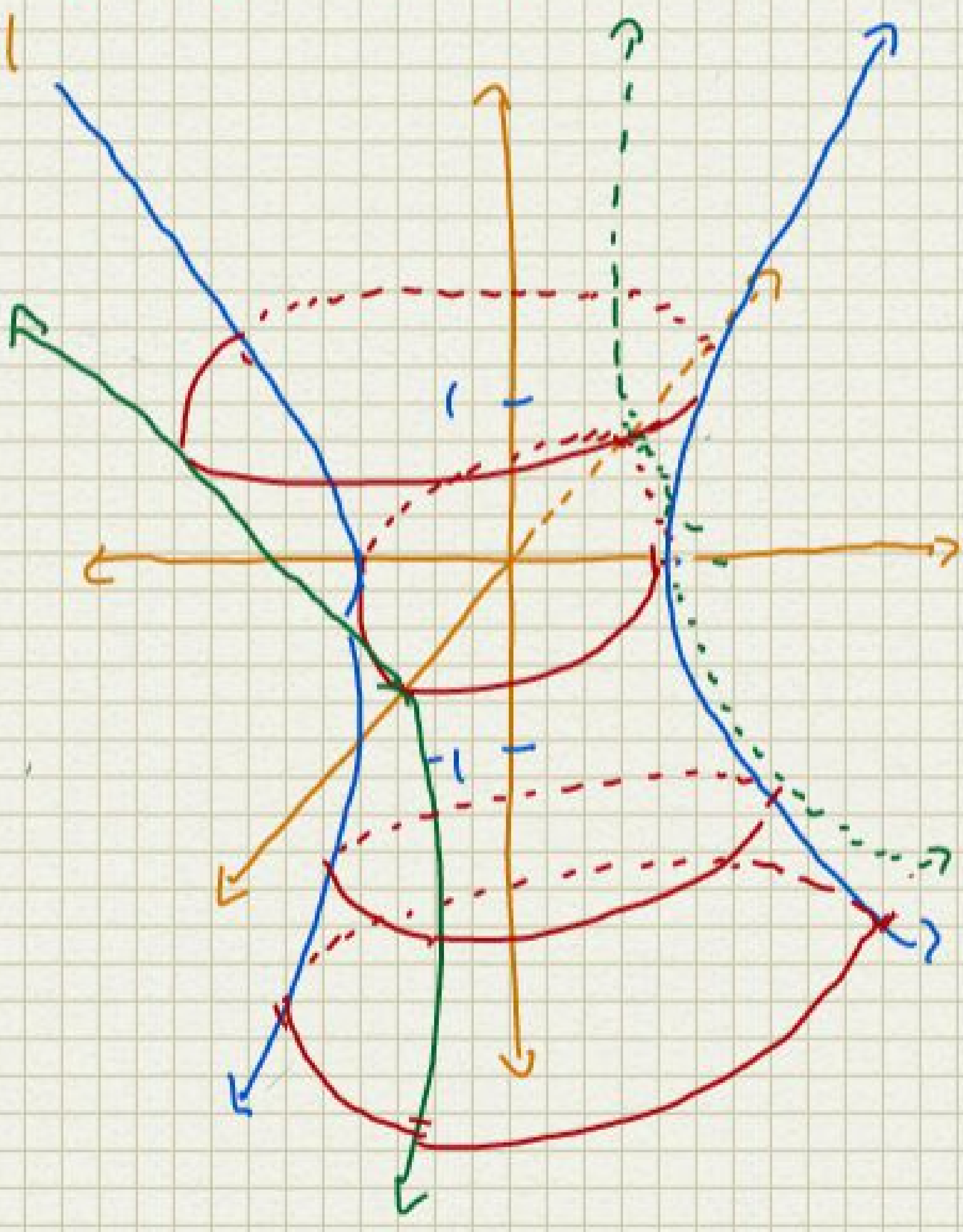
x^2 & y^2 agree w/ right hand side

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

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

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

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



2 sheets

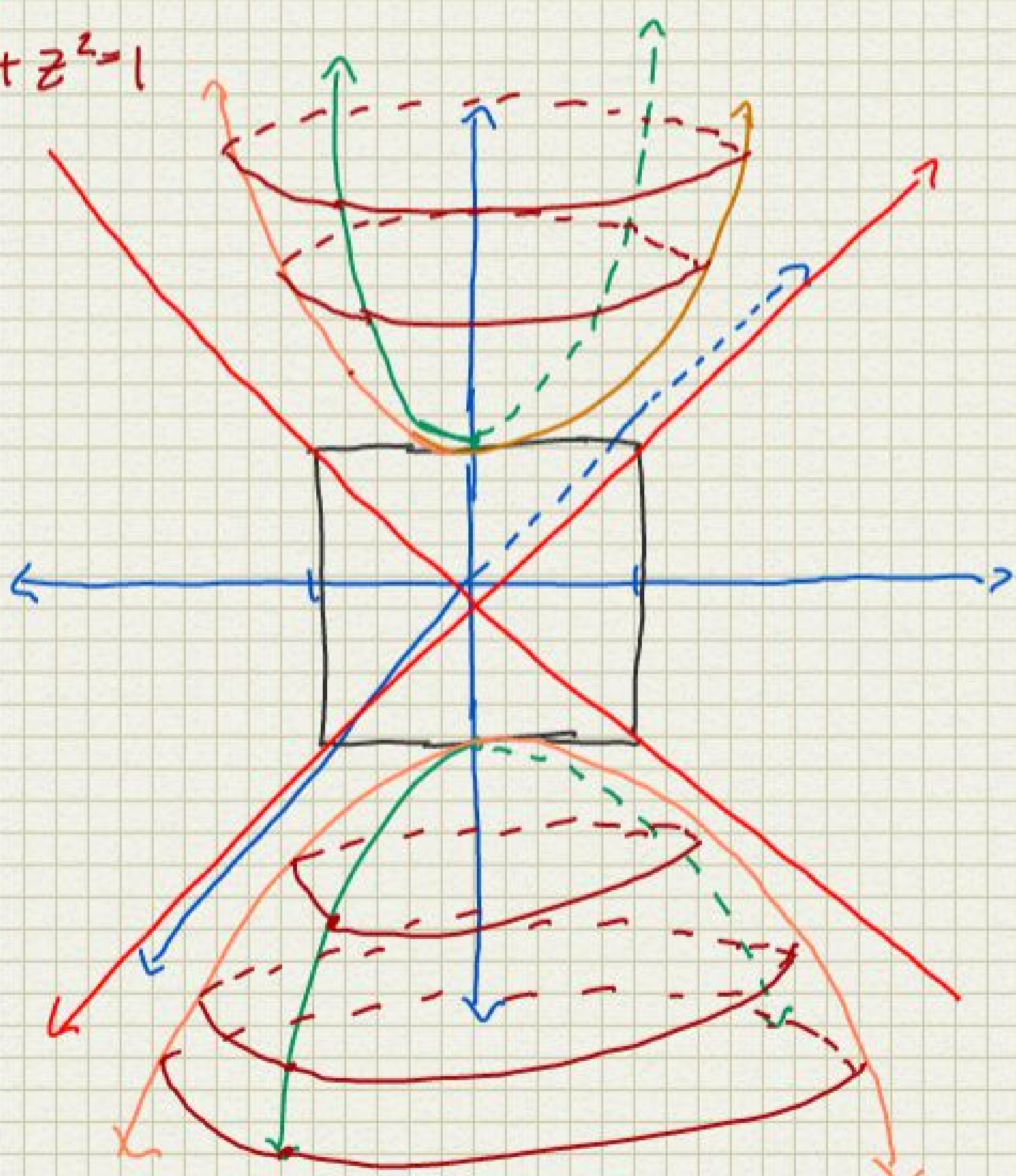
z^2 agrees w/ RHS

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

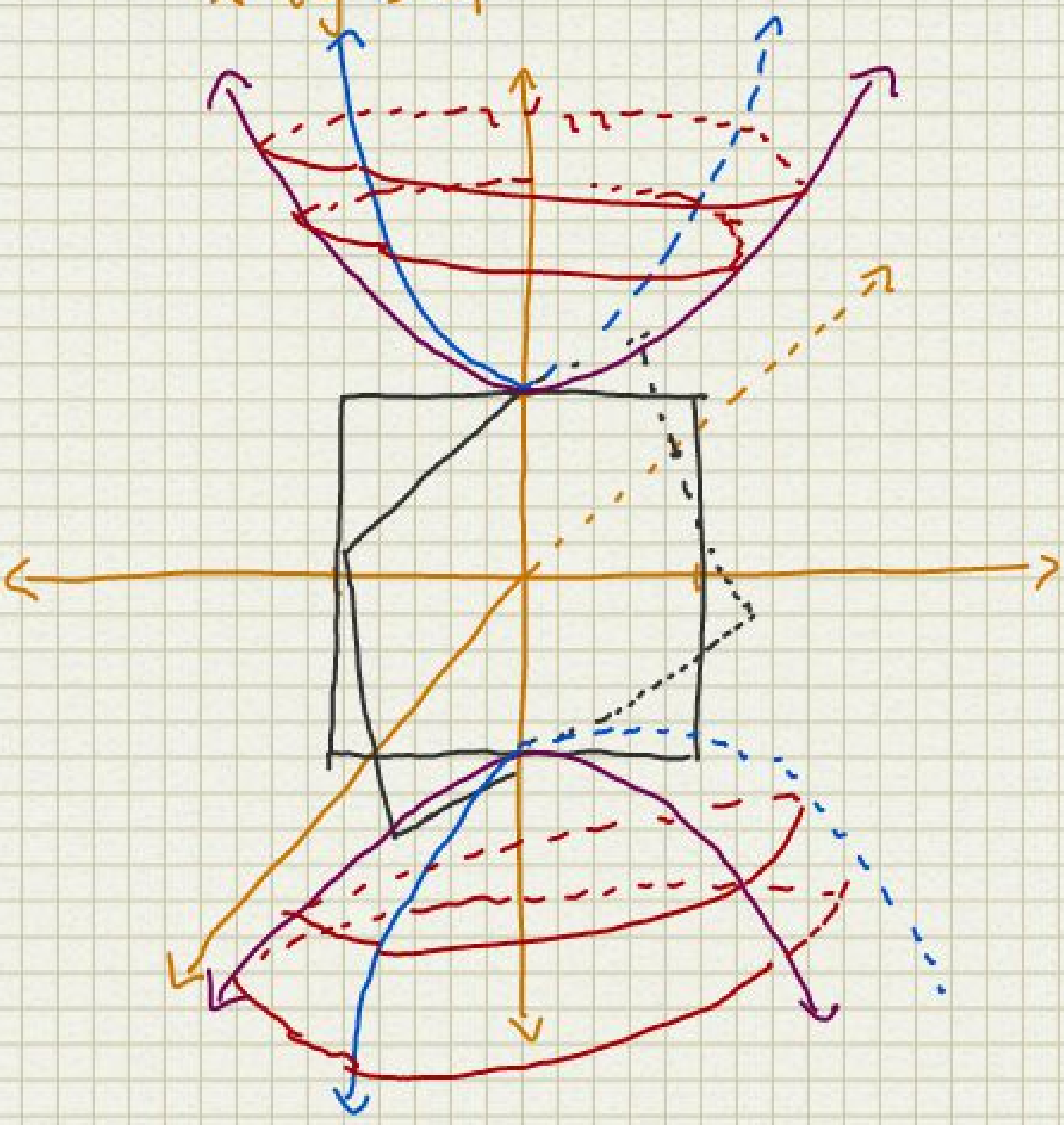
$\begin{cases} \cancel{z=\emptyset} \\ \cancel{-x^2-y^2=1} \end{cases}$ no solution

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

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



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



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

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

<u>Cone</u>

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

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

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