Hyperboloids of one sheet

1. Let $h$, $k$ and $\ell$ be real numbers. The equation of an hyperbola of one sheet with center $(h, k, \ell)$ is a formula which has $\frac{(x - h)^2}{a^2}$, $\frac{(y - k)^2}{b^2}$, $\frac{(z - k)^2}{c^2}$, an $= 1$, and two additions and one subtraction.

2. To remember that we have a hyperboloid of one sheet, remember that the formula for a hyperboloid of one sheet has the equation of an ellipse stuck inside of it. For example, \[ \frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} + \frac{(z - k)^2}{c^2} = 1 \] is a formula for a hyperboloid of one sheet and if we set $k = 0$, we obtain \[ \frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1 \] which is the equation of an ellipse.

3. To remember that we have a hyperboloid of one sheet, remember that the formula for a hyperboloid of one sheet has the equation of an ellipse stuck inside of it. For example, \[ \frac{(x - 1)^2}{100} + \frac{(y - 2)^2}{400} - \frac{(z - 3)^2}{900} = 1 \] is a formula for a hyperboloid of one sheet and if we set $z = 3$, we obtain \[ \frac{(x - 1)^2}{100} + \frac{(y - 2)^2}{400} = 1 \] which is the equation of an ellipse.

4. Inequalities for \[ \frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} - \frac{(z - \ell)^2}{c^2} = 1: \]

   FIX THIS

   (a) If $d + e - f = 1$ and $f$ is either positive or zero, then $d + e$ is FILL IN than or equal to 1.

   (b) Note that $\frac{(z - \ell)^2}{c^2}$ is either FILL IN or zero. If $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$, then

   i. $\frac{x^2}{a^2}$ is FILL IN than 1

   ii. $x^2$ is FILL IN than or equal to FILL IN.

   iii. $\ell$ is FILL IN than or equal to $x$ or $x$ is FILL IN than or equal to FILL IN

5. Let’s talk about how to draw the hyperboloid $\frac{x^2}{9} + \frac{y^2}{16} - \frac{z^2}{25} = 1$. 