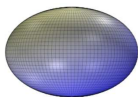


Section 12.6: Quadric Surfaces

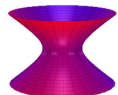
Definition: A quadric surface is the graph of a **second degree** equation in three variables.

I. Ellipsoid: The quadric surface with the equation $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ is called an **ellipsoid**

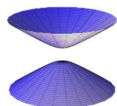


II. Hyperboloid:

A.) Hyperboloid of one sheet: $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$.



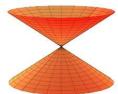
B.) Hyperboloid of two sheets: $-\frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.



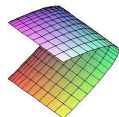
III. Elliptic Paraboloid: $\frac{z}{c} = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.



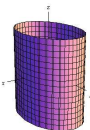
IV. Cone: $\frac{z^2}{c^2} = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.



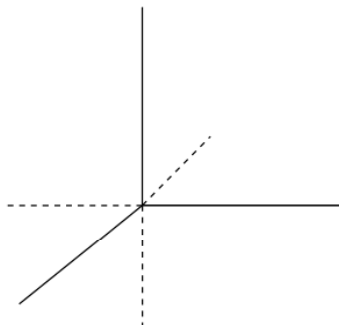
V. Parabolic cylinder: One general form is $y = ax^2$. Sketch the graph of $y = ax^2$ in the xy - plane, then raise and lower along the z axis.



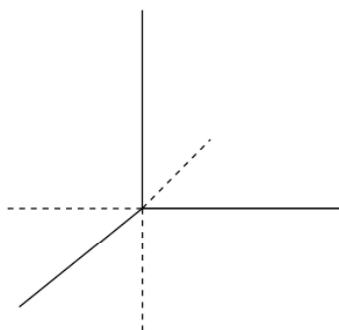
VI. Elliptic cylinder: One general form is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.



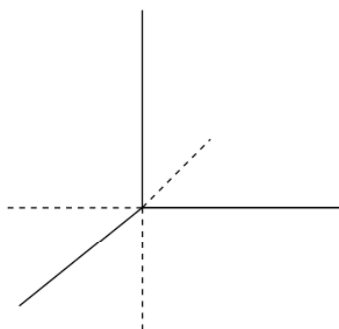
Example 1: Sketch the graph of $x^2 - \frac{y^2}{4} - \frac{z^2}{9} = 1$ and label the intercepts.



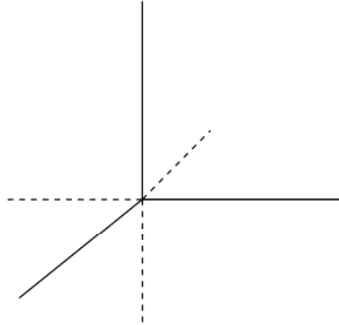
Example 2: Sketch the graph of $y^2 = \frac{x^2}{9} + \frac{z^2}{4}$ and label the intercepts.



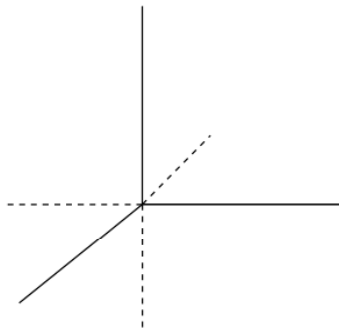
Example 3: Sketch the graph of $x^2 + \frac{y^2}{9} + \frac{z^2}{4} = 1$ and label the intercepts.



Example 4: Sketch the graph of $y = \frac{x^2}{4} + \frac{z^2}{16}$ and label the intercepts.



Example 5: Sketch the graph of $\frac{y^2}{4} + \frac{x^2}{9} = 1 + z^2$ and label the intercepts.



Example 6: Sketch the graph of $x^2 + \frac{z^2}{9} - 4 = 0$

