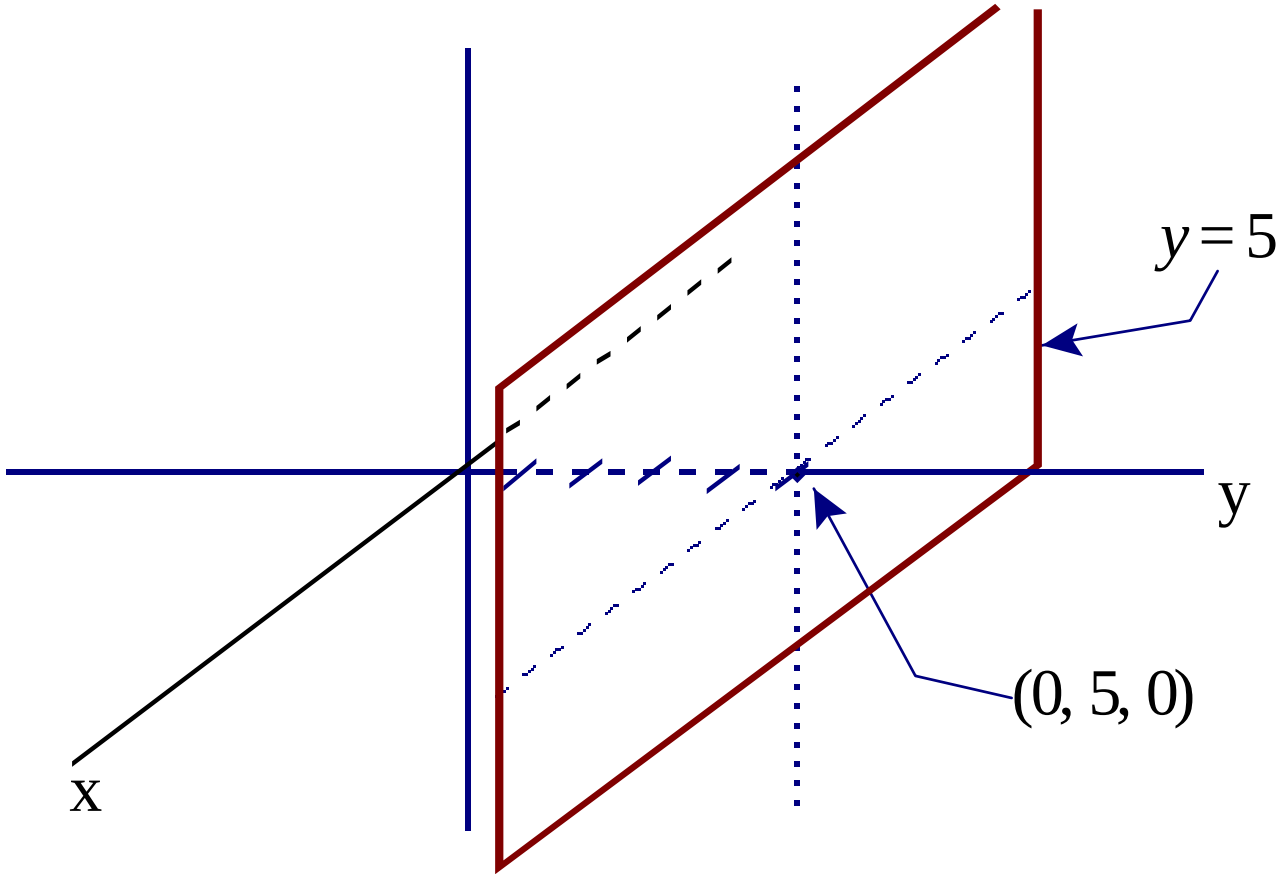
Cylinders

Spring 2018

Pat Rossi Name _____

7. $y = 5$

This is a plane that is parallel to the plane $y = 0$ (the x-z plane). This plane is 5 units to the right of the plane $y = 0$ (the x-z plane).

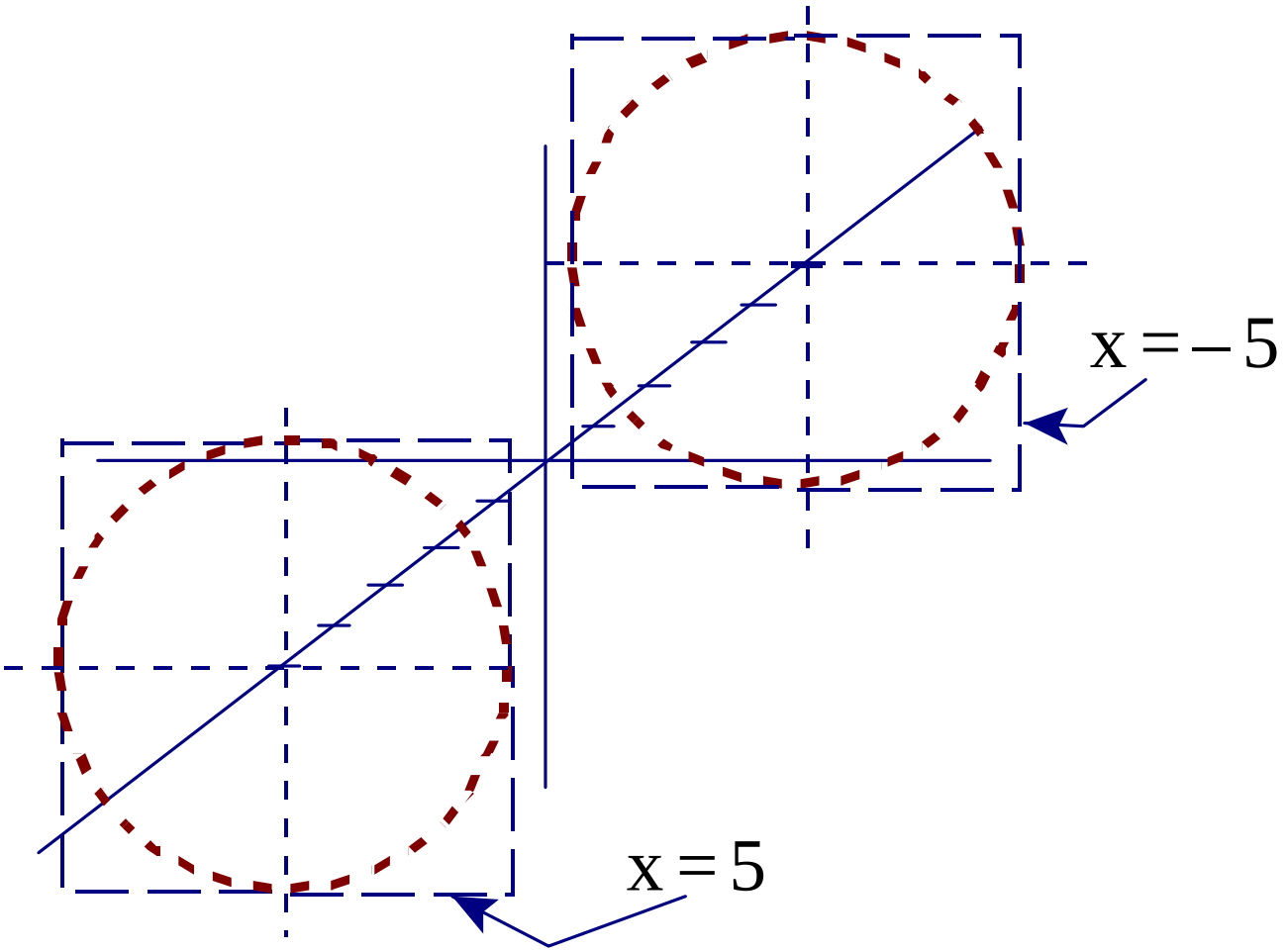


9. $y^2 + z^2 = 9$

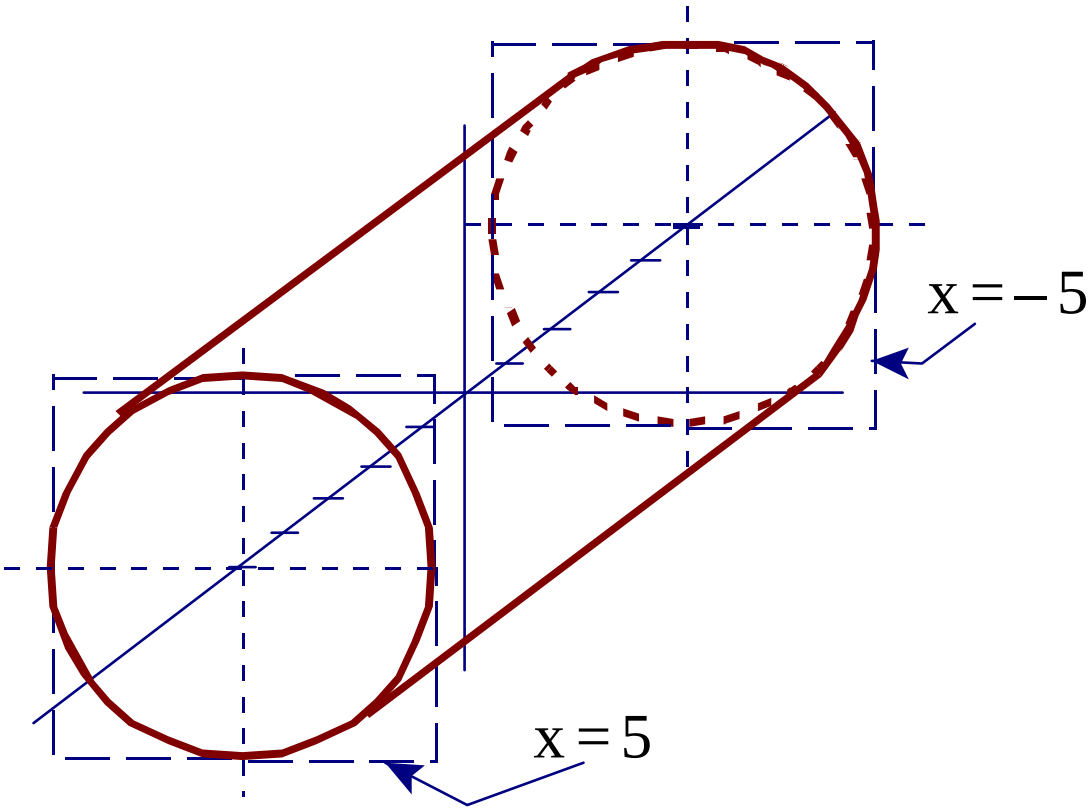
This is a **cylinder** (a function of only two of the three variables x, y, and z). The best way to draw a cylinder is to sketch level curves. Since x is the variable missing from the original equation, we will sketch our level curves in the planes $x = c$ (where c is constant)

The intersection of this graph with the plane $x = 0$ (the y-z plane) is a circle of radius 3, centered at $(y, z) = (0, 0)$. The intersection of the graph with every plane parallel to the y-z plane is also a circle of radius 3, centered at $(y, z) = (0, 0)$. So we will sketch level curves in the planes parallel to $x = 0$ (for example: $x = -5$ and $x = 5$)

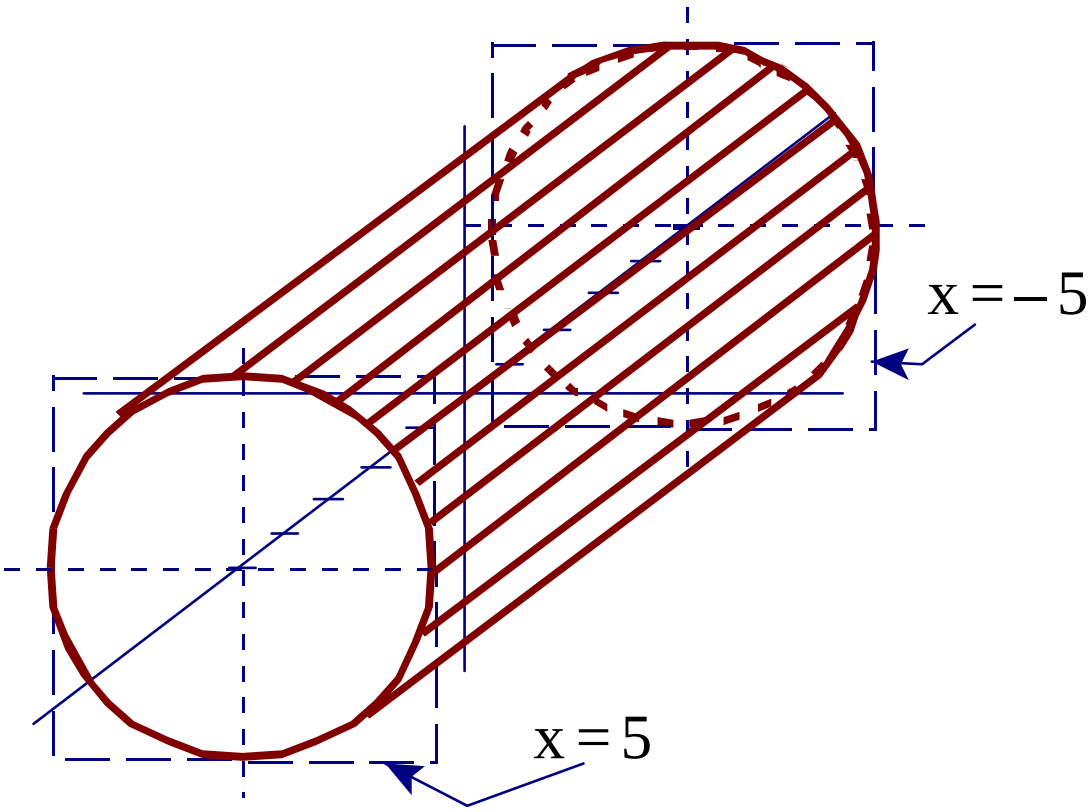
First, we sketch two level curves of $y^2 + z^2 = 9$ in the planes $x = -5$ and $x = 5$.



Next, we sketch, with solid lines, the visible edges of the surfaces.



Finally, we sketch lines to define the visible portion of the surface.

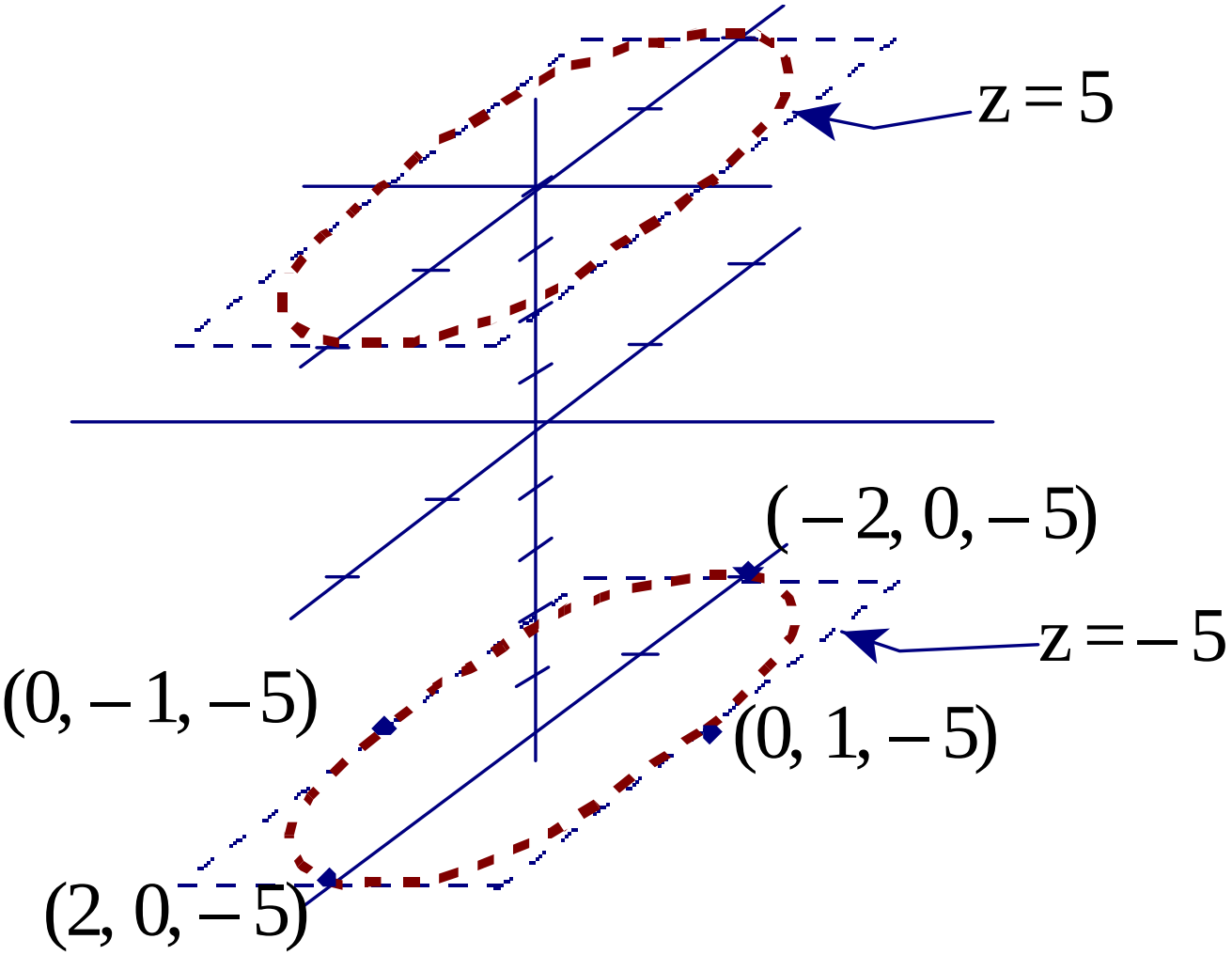


11. $4x^2 + y^2 = 4$

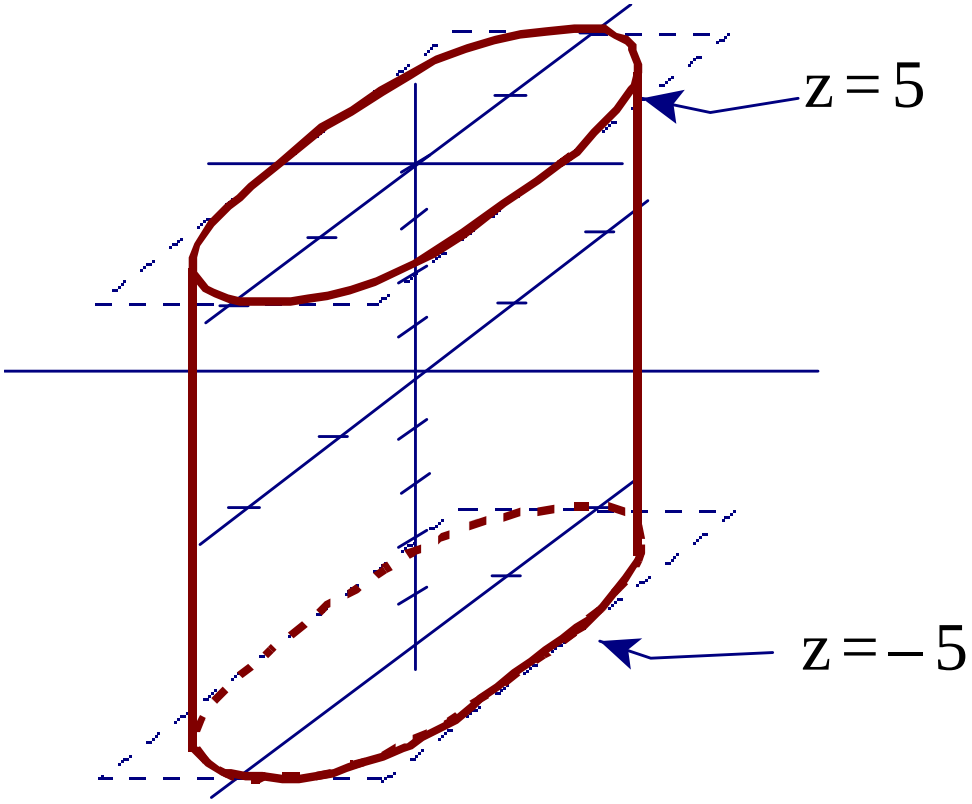
This is the same as $\frac{x^2}{1^2} + \frac{y^2}{2^2} = 1^2$

This is a **cylinder** (a function of only two of the three variables x, y, and z). The best way to draw a cylinder is to sketch level curves. Since z is the variable missing from the original equation, we will sketch our level curves in the planes $z = c$ (where c is constant)

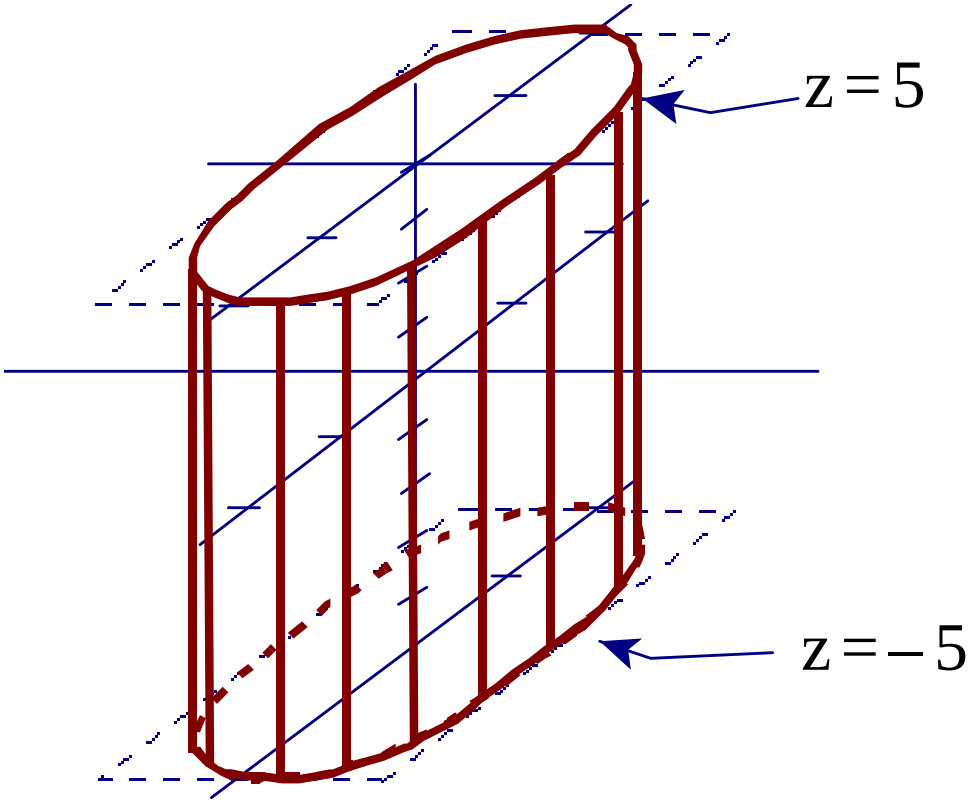
The intersection of this graph with the plane $z = 0$ (the x-y plane) is an ellipse, centered at $(x, y) = (0, 0)$. This ellipse has a "horizontal axis" with endpoints $(x, y) = (\pm 2, 0)$ on the x-axis; and a "vertical axis" with endpoints $(x, y) = (0, \pm 1)$ on the y-axis. The intersection of the graph with every plane parallel to the x-y plane is the same ellipse. So we will sketch level curves of $\frac{x^2}{1^2} + \frac{y^2}{2^2} = 1^2$ in planes parallel to $z = 0$ (for example: $z = -5$ and $z = 5$)



Next, we sketch, with solid lines, the visible edges of the surfaces.



Finally, we sketch lines to define the visible portion of the surface.

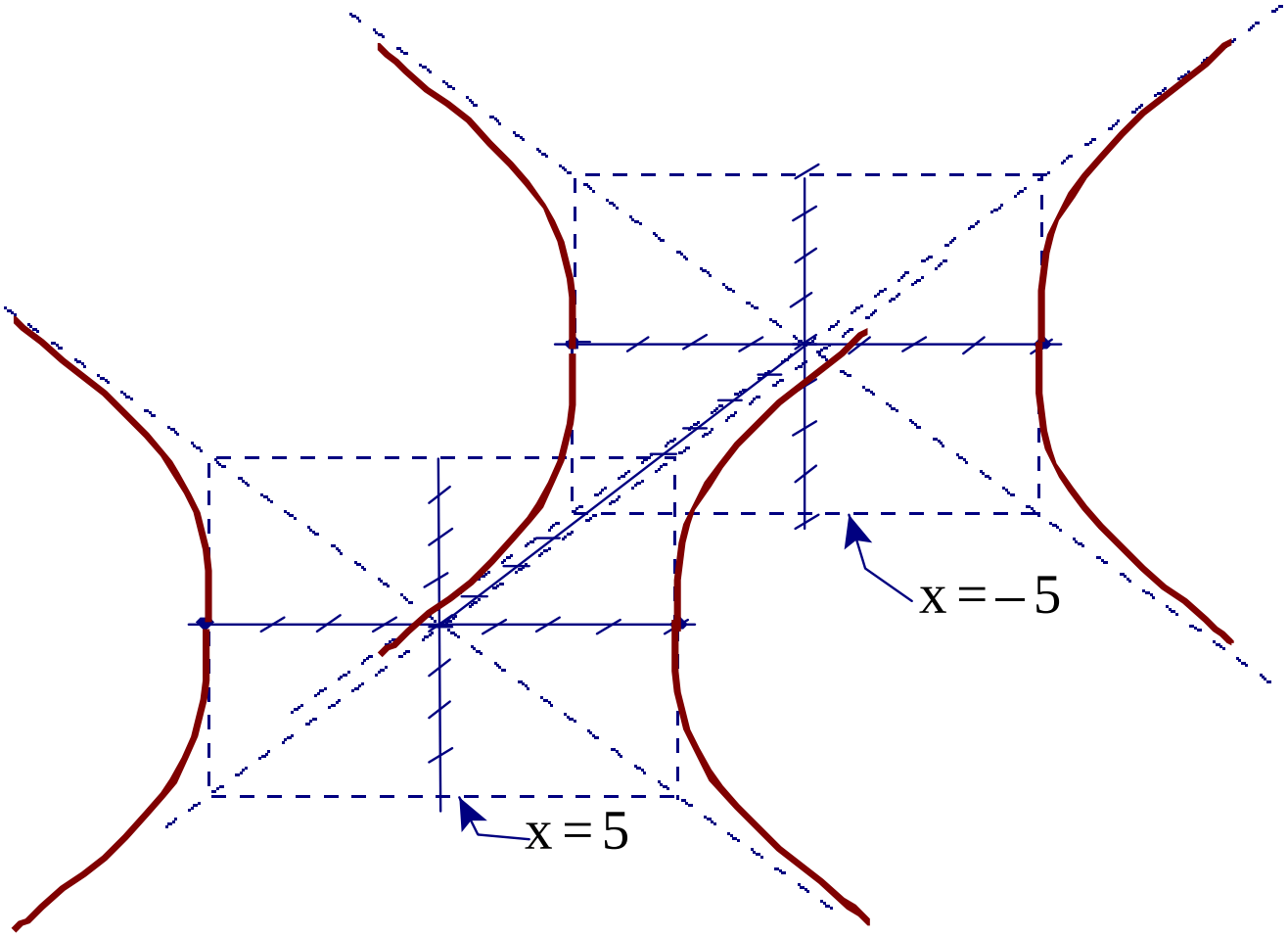


12. $y^2 - z^2 = 16$

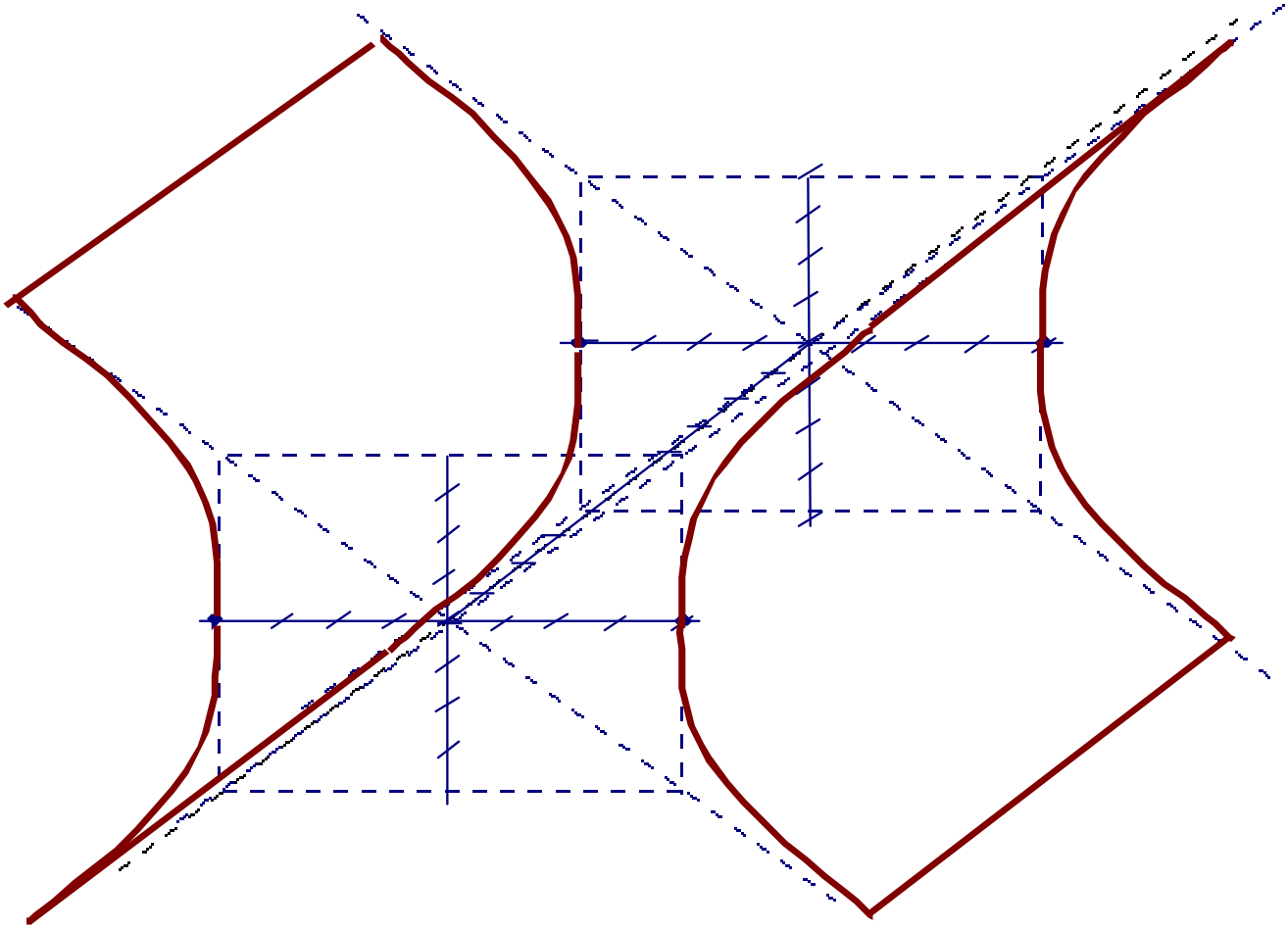
This is the same as $\frac{y^2}{4^2} - \frac{z^2}{4^2} = 1^2$

This is a **cylinder** (a function of only two of the three variables x, y, and z). The best way to draw a cylinder is to sketch level curves. Since x is the variable missing from the original equation, we will sketch our level curves in the planes $x = c$ (where c is constant)

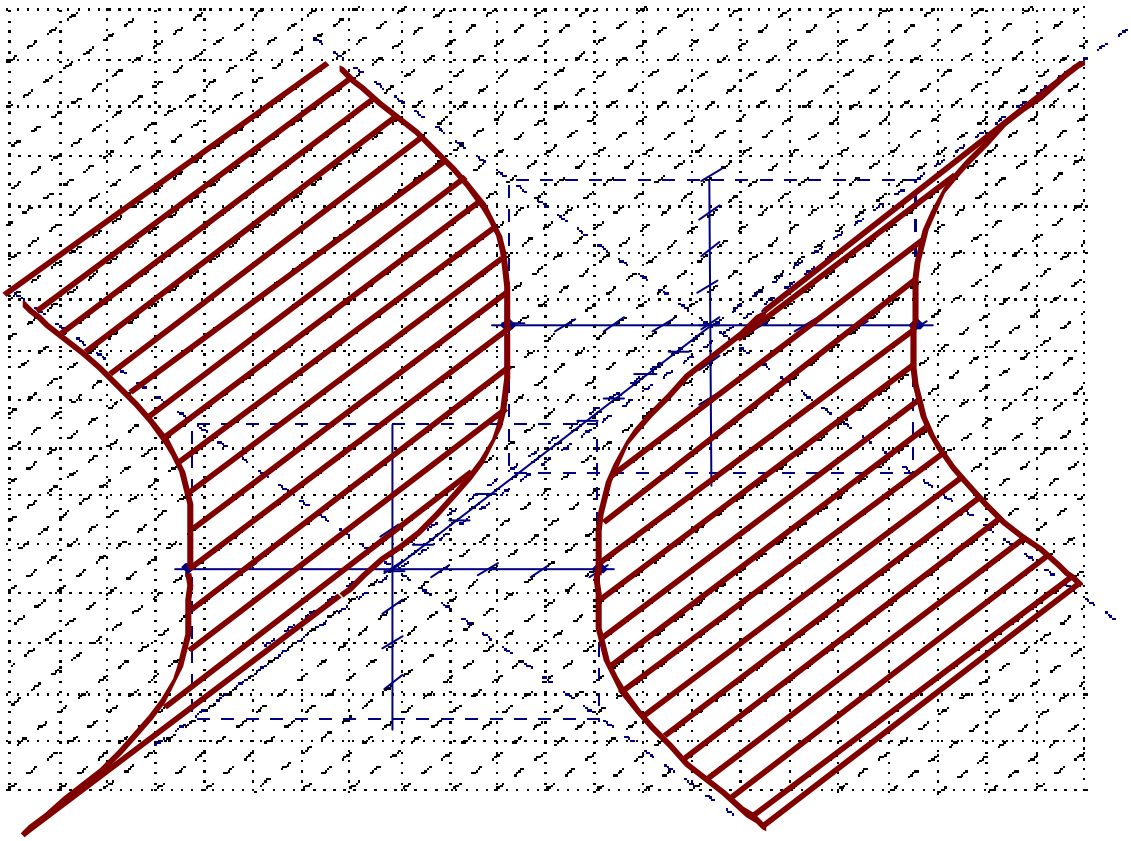
The intersection of this graph with the plane $x = 0$ (the y-z plane) is a hyperbola, centered at $(y, z) = (0, 0)$. This hyperbola has a "horizontal axis" (opening in the positive and negative y directions) with endpoints $(y, z) = (\pm 4, 0)$ on the y-axis; and a "vertical axis" with endpoints $(y, z) = (0, \pm 4)$ on the z-axis. The intersection of the graph with every plane parallel to the y-z plane is the same hyperbola. So we will sketch level curves of $\frac{y^2}{4^2} - \frac{z^2}{4^2} = 1^2$ in planes parallel to $x = 0$ (for example: $x = -5$ and $x = 5$)



Next, we sketch, with solid lines, the visible edges of the surfaces.



Finally, we sketch lines to define the visible portion of the surface.



The same graph , but without the grid, below: