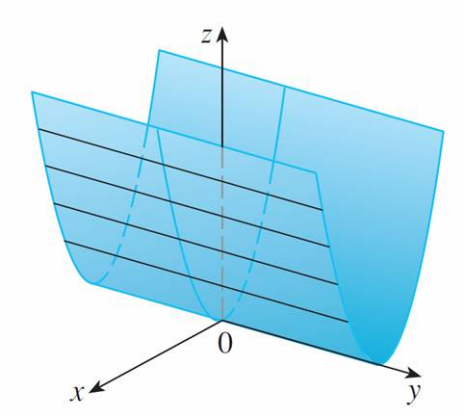
Name: _____

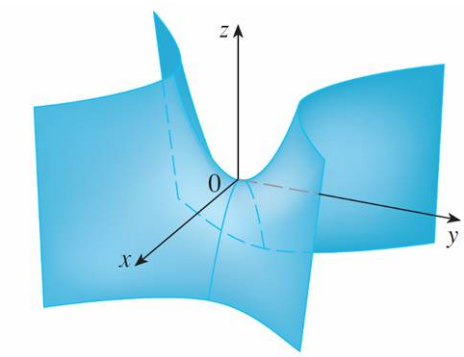
Clear your desk of everything excepts pens, pencils and erasers.
If you have a question, please raise your hand.

1. (2 points) Which equation describes the pictured surface?



Solution: We can see that the surface is a cylinder, whose cross-sections with planes $y = c$ are parabolas. So the equation is $z = x^2$ (note that y is missing).

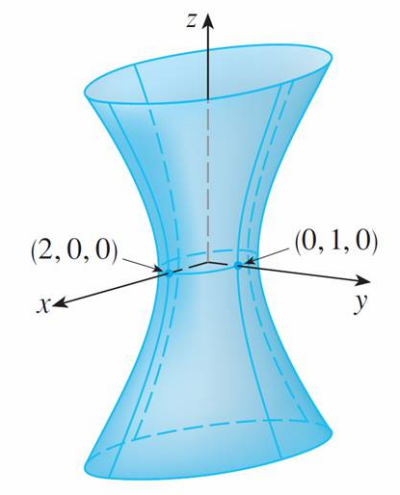
2. (2 points) Which equation describes the pictured surface?



Solution: Notice that the cross sections with $z = c$ for $c > 0$ are hyperbolas which cross the y-axis. So the equation is $z = y^2 - x^2$.

Continue on to back side

3. The following questions are all about the surface pictured below:



(a) (1 point) What is this surface called?

Solution: This is a hyperboloid of one sheet.

(b) (1 point) What are the cross-sections with planes $z = c$, where c is a constant?

Solution: They are ellipses.

(c) (**Bonus**, 1 point) Write an equation (in x and y) for the cross-sectional curve in the plane $z = 0$.

Solution: From the picture, it appears the cross section in the plane $z = 0$ is an ellipse which is stretched by 2 in the x-direction, and by 1 in the y-direction. So the equation should be

$$\left(\frac{x}{2}\right)^2 + y^2 = 1$$

This leads one to believe that the equation of the hyperboloid is probably

$$z^2 = \left(\frac{x}{2}\right)^2 + y^2 - 1$$