1. (a) What does the equation $y = x^2$ represent as a curve in $\mathbb{R}^2$?
(b) What does it represent as a surface in $\mathbb{R}^3$?
(c) What does the equation $z = y^2$ represent?

2. (a) Sketch the graph of $y = e^x$ as a curve in $\mathbb{R}^2$.
(b) Sketch the graph of $y = e^x$ as a surface in $\mathbb{R}^3$.
(c) Describe and sketch the surface $z = e^y$.

3–8 Describe and sketch the surface.

3. $y^2 + 4z^2 = 4$

9. (a) Find and identify the traces of the quadric surface $x^2 + y^2 - z^2 = 1$ and explain why the graph looks like the graph of the hyperboloid of one sheet in Table 1.
(b) If we change the equation in part (a) to $x^2 - y^2 + z^2 = 1$, how is the graph affected?
(c) What if we change the equation in part (a) to $x^2 + y^2 + 2y - z^2 = 0$?

11–20 Use traces to sketch and identify the surface.

11. $x = y^2 + 4z^2$ **12.** $9x^2 - y^2 + z^2 = 0$

13. $x^2 = y^2 + 4z^2$ **14.** $25x^2 + 4y^2 + z^2 = 100$

15. $-x^2 + 4y^2 - z^2 = 4$

21–28 Match the equation with its graph (labeled I–VIII). Give reasons for your choices. **Graphs are on Page 2.**

21. $x^2 + 4y^2 + 9z^2 = 1$ **22.** $9x^2 + 4y^2 + z^2 = 1$

23. $x^2 - y^2 + z^2 = 1$ **24.** $-x^2 + y^2 - z^2 = 1$

25. $y = 2x^2 + z^2$ **26.** $y^2 = x^2 + 2z^2$

27. $x^2 + 2z^2 = 1$ **28.** $y = x^2 - z^2$

29–36 Reduce the equation to one of the standard forms, classify the surface, and sketch it.

29. $z^2 = 4x^2 + 9y^2 + 36$ **30.** $x^2 = 2y^2 + 3z^2$

31. $x = 2y^2 + 3z^2$ **32.** $4x - y^2 + 4z^2 = 0$

33. $4x^2 + y^2 + 4z^2 - 4y - 24z + 36 = 0$

34. $4y^2 + z^2 - x - 16y - 4z + 20 = 0$

35. $x^2 - y^2 + z^2 - 4x - 2y - 2z + 4 = 0$

36. $x^2 - y^2 + z^2 - 2x + 2y + 4z + 2 = 0$

I think doing a really nice job on ONE of these and sharing it.

8 problems. 8 students.

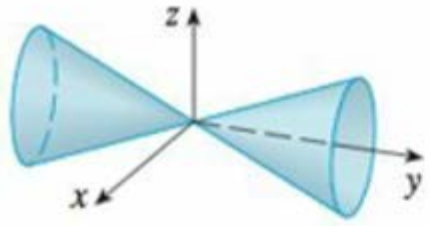
Sounds like a plan.

I would do a less-careful job on as many as time permitted.

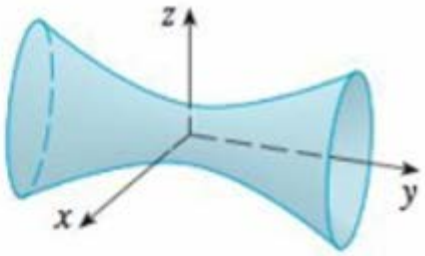
41. Sketch the region bounded by the surfaces $z = \sqrt{x^2 + y^2}$ and $x^2 + y^2 = 1$ for $1 \leq z \leq 2$.

42. Sketch the region bounded by the paraboloids $z = x^2 + y^2$ and $z = 2 - x^2 - y^2$.

I



II



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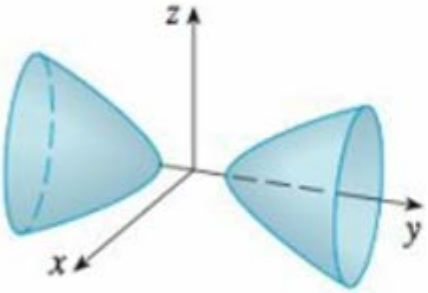

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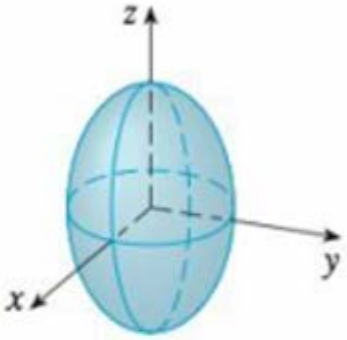

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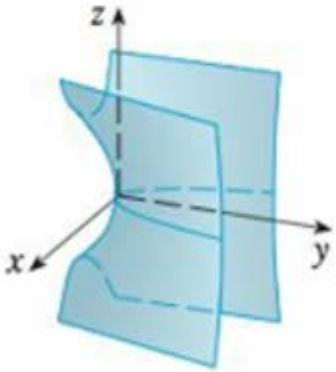

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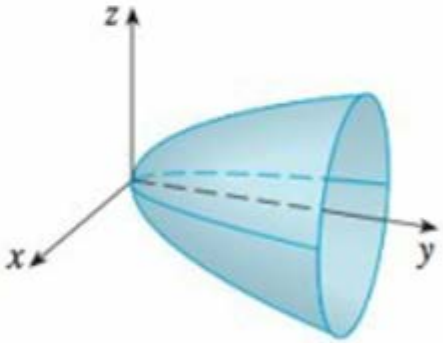
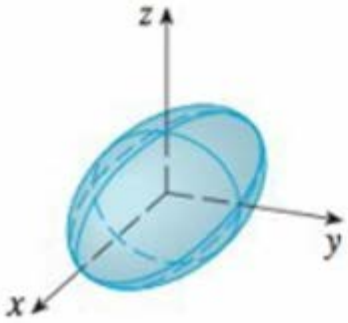


VII



VIII