

Calculus II

Lecture 14

Todor Milev

<https://github.com/tmilev/freecalc>

2020

Outline

- 1 Surface area of solid of revolution

License to use and redistribute

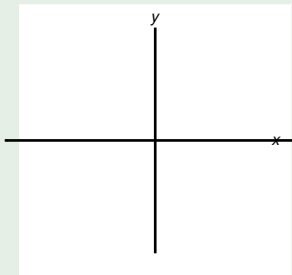
These lecture slides and their \LaTeX source code are licensed to you under the Creative Commons license CC BY 3.0. You are free

- to Share - to copy, distribute and transmit the work,
- to Remix - to adapt, change, etc., the work,
- to make commercial use of the work,

as long as you reasonably acknowledge the original project.

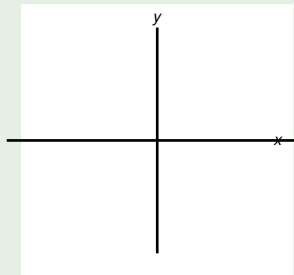
- Latest version of the .tex sources of the slides:
<https://github.com/tmilev/freecalc>
- Should the link be outdated/moved, search for “freecalc project”.
- Creative Commons license CC BY 3.0:
<https://creativecommons.org/licenses/by/3.0/us/>
and the links therein.

Example



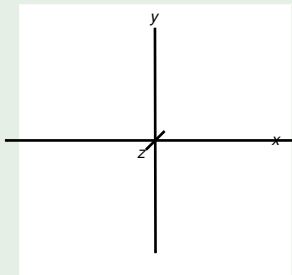
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



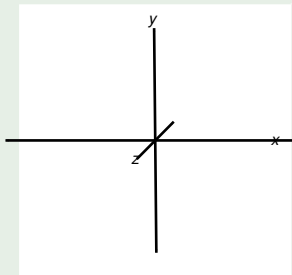
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



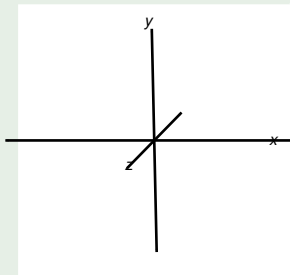
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



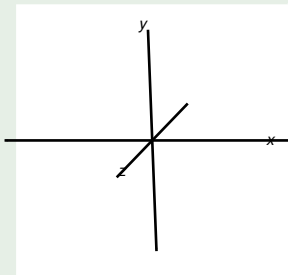
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



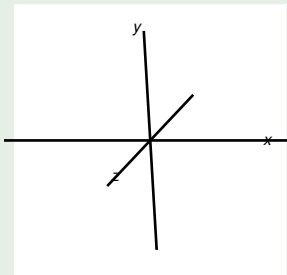
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



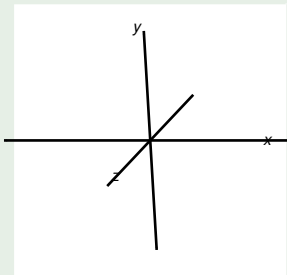
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



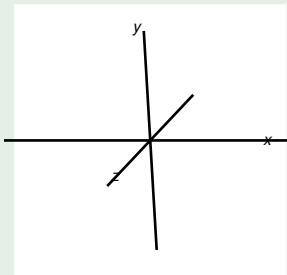
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



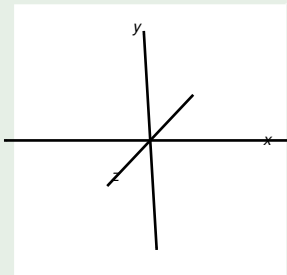
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



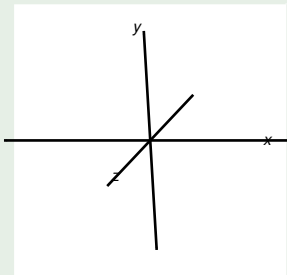
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



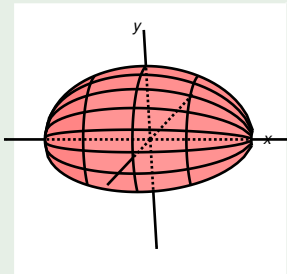
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



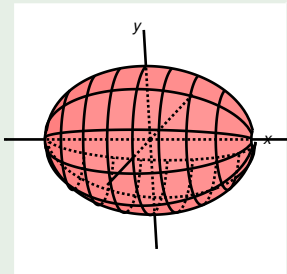
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



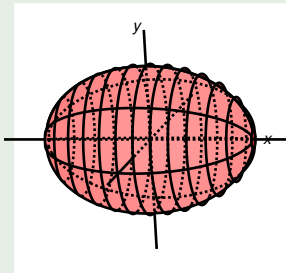
Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

Example



Find the surface area of the ellipsoid obtained by rotating $y = \sqrt{1 - \frac{x^2}{2}}$ about the x axis.

$$y' = \frac{1}{2} \frac{(-x)}{\sqrt{1 - \frac{x^2}{2}}} = -\frac{x}{2y}$$

$$(y')^2 = \frac{x^2}{4y^2}$$

$$\begin{aligned}
 \text{Area} &= \int_{-2}^2 2\pi y \sqrt{1 + \frac{x^2}{4y^2}} dx \\
 &= \int_{-2}^2 2\pi y \sqrt{\frac{4y^2 + x^2}{4y^2}} dx \\
 &= \int_{-2}^2 2\pi y \sqrt{\frac{4y^2 + x^2}{4y^2}} dx \\
 &= \int_{-2}^2 \pi \sqrt{4 \left(1 - \frac{x^2}{2}\right) + x^2} dx \\
 &= \int_{-2}^2 \pi \sqrt{4 - x^2} dx
 \end{aligned}$$