

Important to know...

Answers

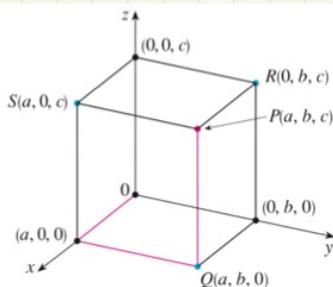


FIGURE 5

① The distance from $P(x_1, y_1, z_1)$ to $P(x_2, y_2, z_2)$ is

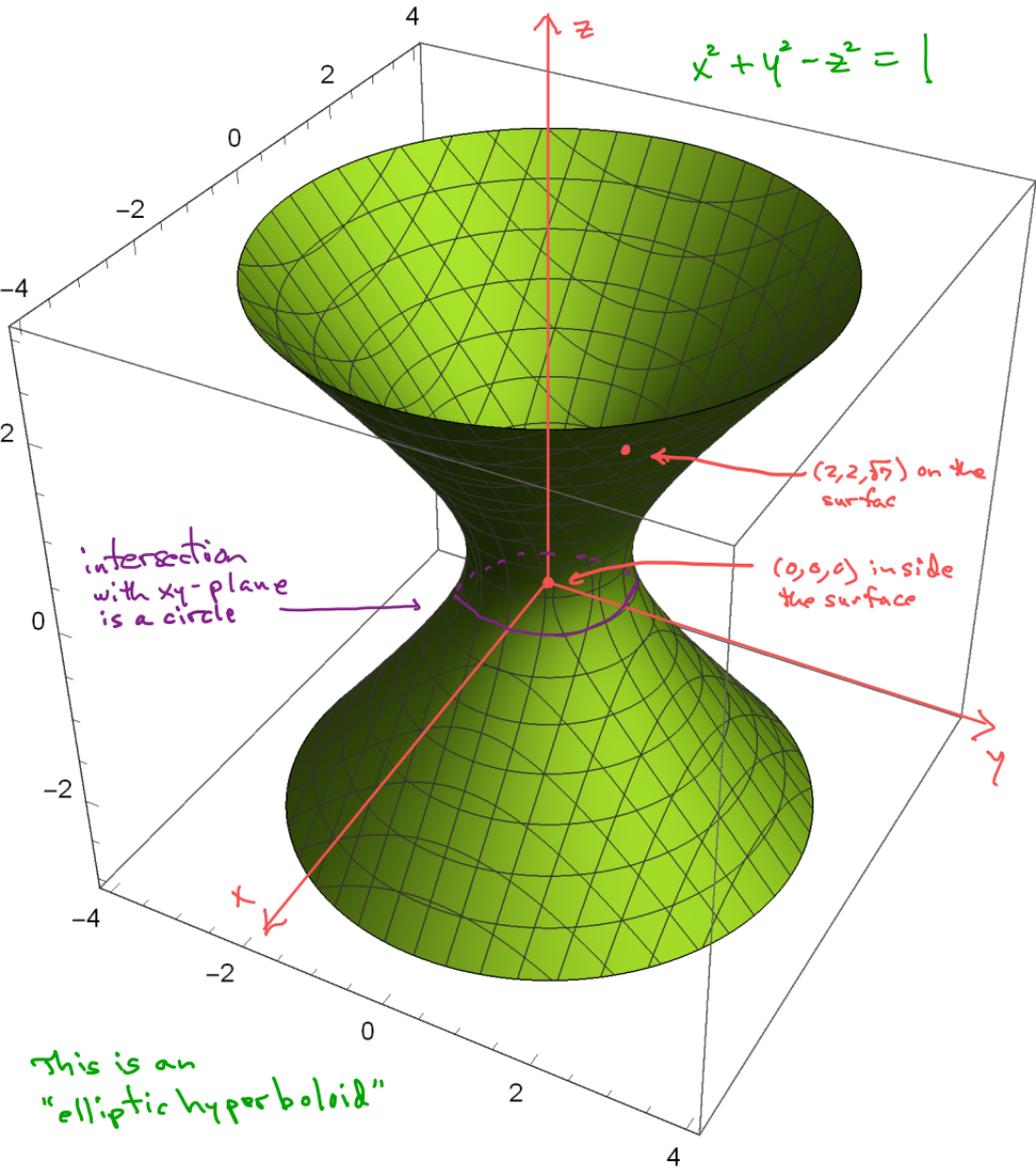
$$\text{dist}(P, Q) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

observe: $\text{dist}(P, Q) = \text{dist}(Q, P)$ (can you show it?)

⑤ The graph in xyz -space of an equation in $F(x, y, z) = 0$ with variables x, y, z consists of all points (x, y, z) which satisfy the equation.

Example Consider the equation $x^2 + y^2 - z^2 = 1$ (which may also be written as $x^2 + y^2 - z^2 - 1 = 0$),

- its graph does not go thru $(0, 0, 0)$ because $0^2 + 0^2 - 0^2 \neq 1$
 - its graph does go thru $(2, 2, \sqrt{7})$ b/c $2^2 + 2^2 - (\sqrt{7})^2 = 1$.
 - its graph contains all points $(x, y, 0)$ where $x^2 + y^2 = 1$.
- The full graph is pictured on the next page (but it will be a few chapters down the road before we can explain this).



answers continued...

(2) The coordinate planes are:

xy -plane: contains x and y axes, and is the graph of $z=0$

xz -plane: contains x and z axes, and is the graph of $y=0$

yz -plane: contains y and z axes, and is the graph of $x=0$

(3) The x -axis consists of all points (x, y, z) where both $y=0$ and $z=0$. These equations describe the x -axis as the intersection of the xy -plane ($z=0$) and the xz -plane ($y=0$). Similarly

y -axis : $x=0$ and $z=0$

z -axis : $x=0$ and $y=0$

(4) The octants are determined by specifying the \pm signs for the x -coordinate of a point, the y -coordinate and the z -coordinate

first octant would be all points (x, y, z) where $x \geq 0$, $y \geq 0$ and $z \geq 0$.

another octant would consist of points (x, y, z) where $x \leq 0$, $y \geq 0$ and $z \leq 0$.

(There are 8 possibilities.)