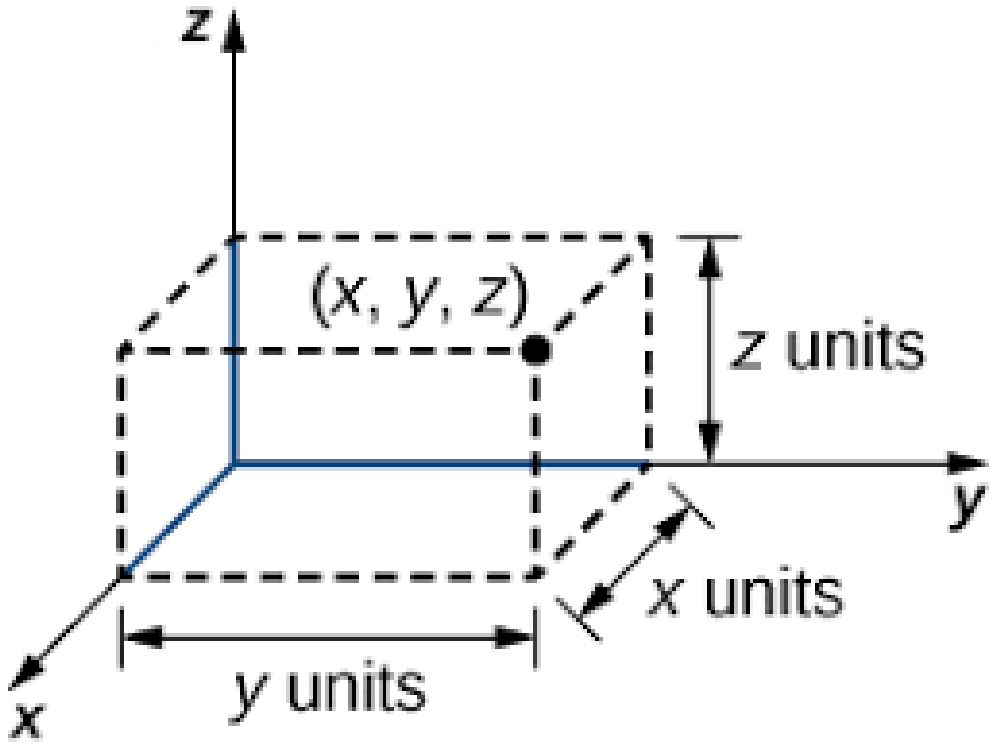
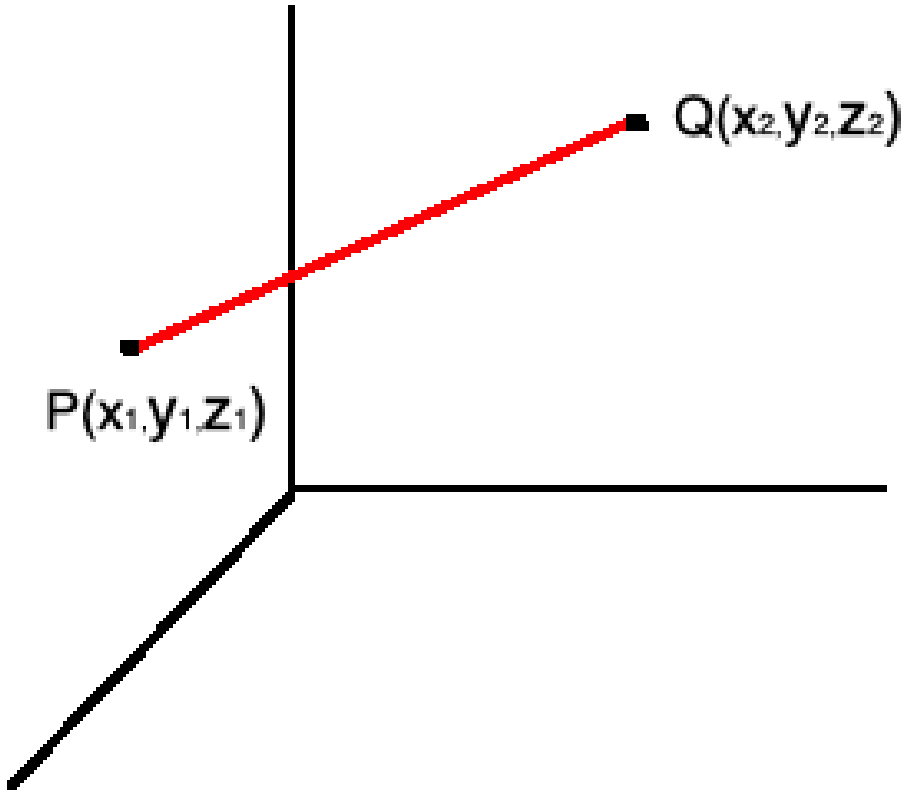
3-D Coordinates



Notation: $\mathbb{R}^3 = \{(x, y, z) : x, y, z \in \mathbb{R}\}$

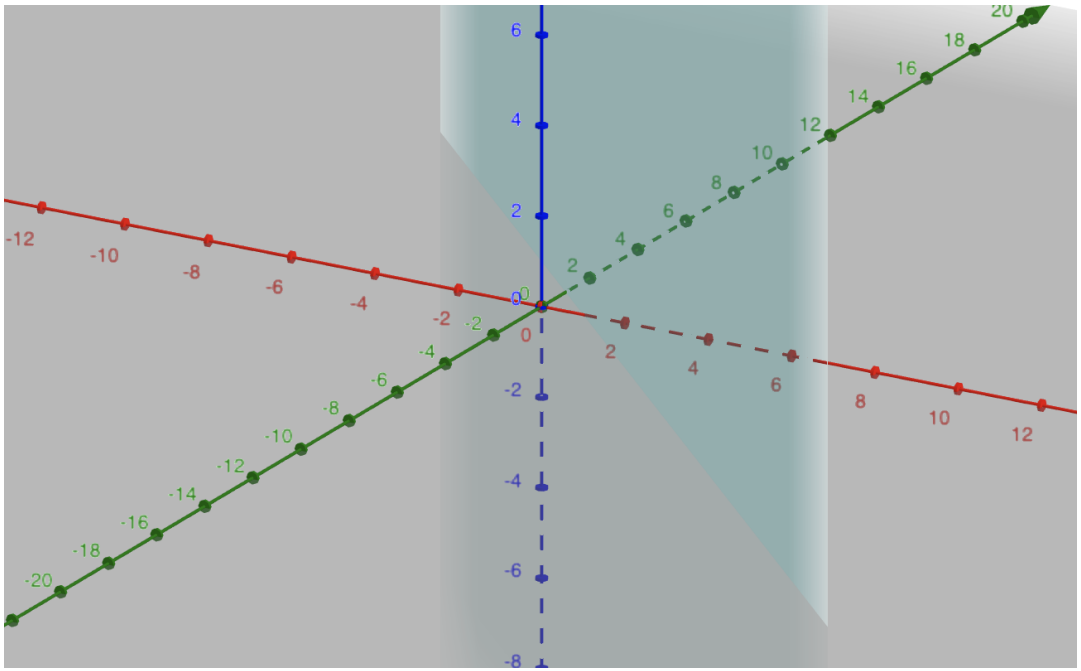


The **distance (or norm)** from P to Q is

$$|PQ| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_2)^2}$$

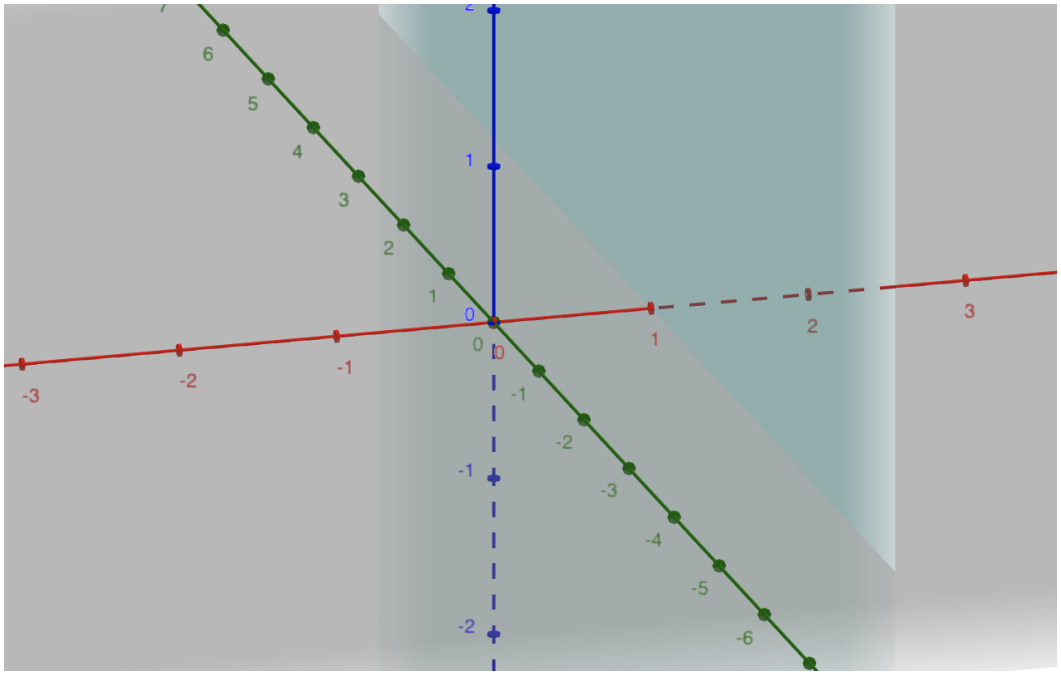
Surfaces in $\mathbb{R}^3$

Equation	$\mathbb{R}^2$	$\mathbb{R}^3$
$x + y = 1$	line	plane



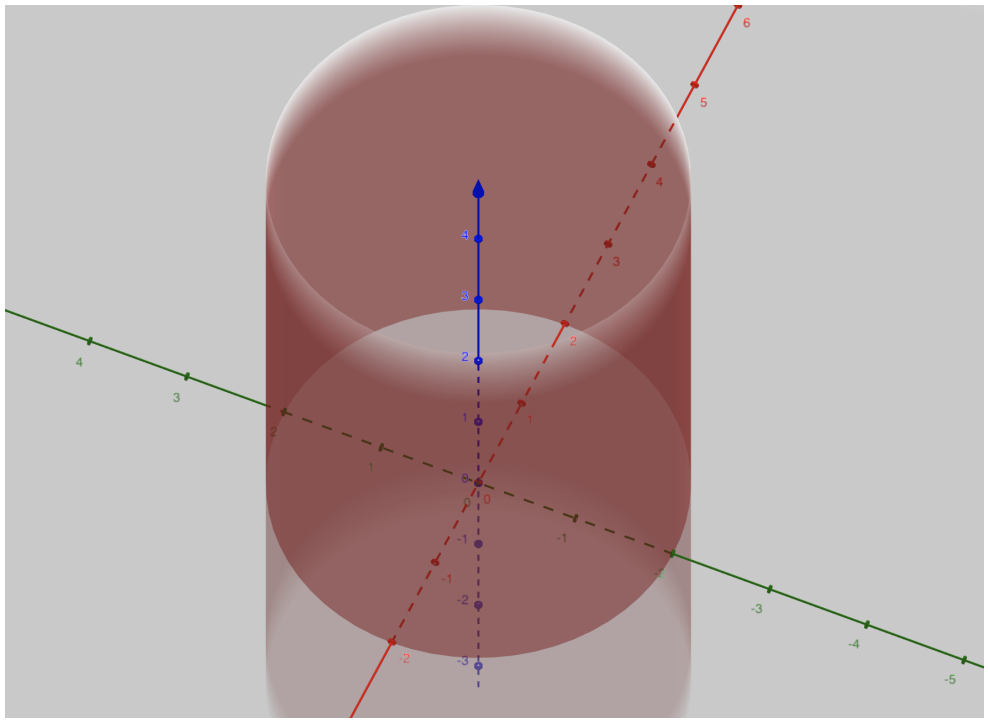
Surfaces in $\mathbb{R}^3$

Equation	$\mathbb{R}^2$	$\mathbb{R}^3$
$x + y = 1$	line	plane
$x = 1$	line	plane



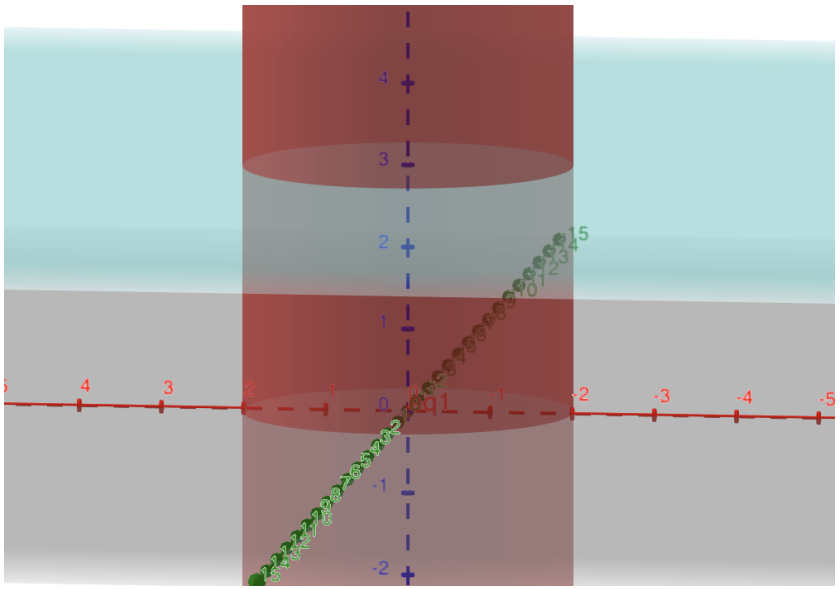
Surfaces in $\mathbb{R}^3$

Equation	$\mathbb{R}^2$	$\mathbb{R}^3$
$x + y = 1$	line	plane
$x = 1$	line	plane
$x^2 + y^2 = 4$	circle	cylinder



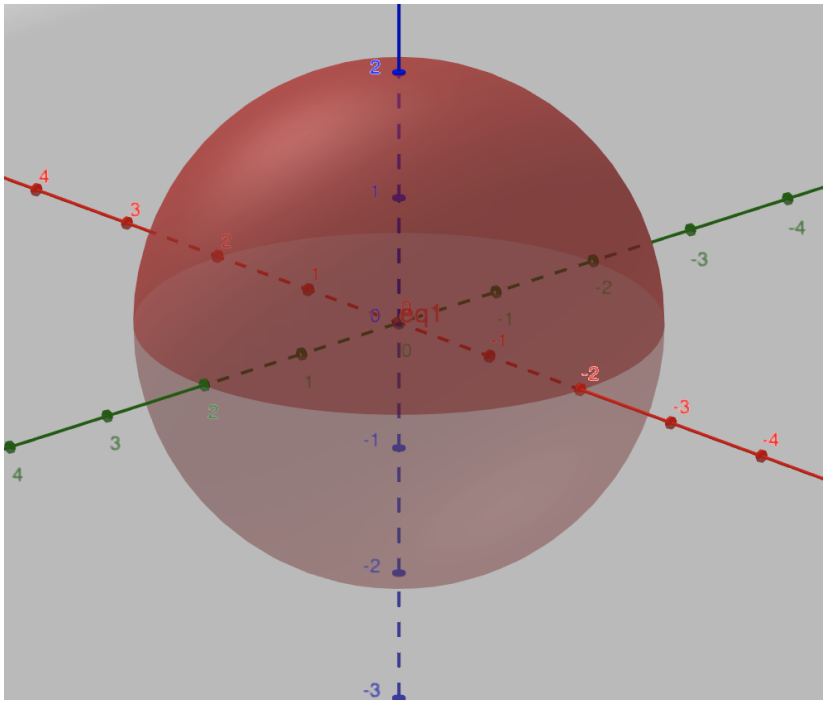
Surfaces in $\mathbb{R}^3$

Equation	$\mathbb{R}^2$	$\mathbb{R}^3$
$x + y = 1$	line	plane
$x = 1$	line	plane
$x^2 + y^2 = 4$	circle	cylinder
$x^2 + y^2 = 4$ and $z = 3$		circle



Surfaces in $\mathbb{R}^3$

Equation	$\mathbb{R}^2$	$\mathbb{R}^3$
$x + y = 1$	line	plane
$x = 1$	line	plane
$x^2 + y^2 = 4$	circle	cylinder
$x^2 + y^2 = 4$ and $z = 3$		circle
$x^2 + y^2 + z^2 = 4$		sphere



1. Sketch the triangle with vertices $P(3, -2, -3)$, $Q(7, 0, 1)$ and $R(1, 2, 1)$. Is the triangle an isosceles?
2. Sketch the surface given by $x^2 + y^2 \leq 9$ and $z = 1$.
3. What is the equation of the sphere with center $(0, -2, 3)$ and radius $r = 5$?
4. Find the center and radius of the sphere $x^2 + 2x + y^2 + z^2 - 6z = 6$
5. Find the equation of the curve where $(x - 3)^2 + y^2 + (z - 1)^2 = 5$ intersects the xy-plane and sketch it.
6. Sketch $y = x^2 + y^2$. (We"ll consider such surfaces in more detail later on)
7. Sketch $z^2 = x^2 + y^2$. (We"ll consider such surfaces in more detail later on)