

## REAL SPACE

## Why

We are constantly thinking of  $\mathbb{R}^3$  as points of space.<sup>1</sup>

## Discussion

We commonly associate elements of  $\mathbb{R}^3$  with points in space. (see Geometry).

**Principle 1** (Plane Sets). There exists a set of all planes.

**Principle 2** (Real Space Correspondence). Let P be the set of all planes of space. Then  $\cup P$  is the set of all lines and  $\cup \cup P$  is the set of all points. There exists a one-to-one correspondence mapping elements of  $\cup \cup P$  onto elements of  $\mathbb{R}^3$ .

For this reason, we sometimes call elements of  $\mathbb{R}^3$  points. We call the point associated with (0,0,0) the *origin*. We call the element of  $\mathbb{R}^3$  which corresponds to a point the *coordinates* of the point.

## Visualization

To visualize the correspondence we draw three perpendicular lines. We call these *axes*. We then associate a point of the line with  $(0,0,0) \in \mathbb{R}^3$ . We can label it so. We then pick a unit length. And proceed as usual.<sup>2</sup>

<sup>&</sup>lt;sup>1</sup>Future editions will modify this sheet.

<sup>&</sup>lt;sup>2</sup>Future editions will expand this.

