

### [6.30] Spherical coordinate conventions

Spherical coordinates specify a point or ray in 3D space with three measurements:

- The magnitude, which is the length of the ray, or the distance from the origin to the point
- The zenith angle, which is measured from the z-axis to the ray
- The azimuth angle, which is measured from the x-axis to the projection of the ray in the xy-plane.

For a picture, refer to the `►sphere` command in your 89/92+ manual.

This definition is unambiguous. However, there is considerable ambiguity when the three measurements are grouped to specify the point. The two possibilities are

(magnitude, azimuth, zenith) *used by the 89/92+*

(magnitude, zenith, azimuth) *used in other references*

This can cause confusing results on the 89/92+, if you are used to the second specification.

Sam Jordan adds:

*Also note that the mapping from rectangular to spherical coordinates is not exactly one-to-one since the rectangular vector  $[0,0,1]$  can be represented by any spherical vector of the form  $[1, <A, <0]$ .*

In this case,

`[0,0,1]►sphere` returns `[1, ∟R►Pθ(0,0), ∟0]`

*(Credit to Gp and Sam Jordan)*