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Calculator Lesson 26

Cylindrical and Spherical Coordinates

In two dimensional space there are two commonly used coordinate systems, rectangular and polar (see Lesson 22). In three dimensional space, there are three commonly used coordinate systems, rectangular, cylindrical and spherical.

The second enunciator at the top of the calculator will show XYZ, R∠Z or R∠∠, respectively to indicate that the calculator is in rectangular, cylindrical, or spherical mode. To change the coordinate mode, press MODE, scroll down to Coord System, press F2-CHOOS and select the desired system from the three presented in the drop down list. Notice that there is no “Cylindrical” on the list. Choosing “Polar” puts the calculator in polar form for two dimensional space and in cylindrical form for three dimensional space. Alternatively, with Coord System selected, you can press the +/- key and cycle through the three choices. The vector $[x \ y \ z]$ in rectangular form will be $[p \ \angle \ q \ z]$ in cylindrical form and $[r \ \angle \ q \ \angle \ v]$ in spherical form. The \angle symbol can be typed from the keyboard by pressing AS > RS > 6. To start the example that follows, set the calculator to RECTANGULAR, DEGREE, and FIX 2.

Enter the vector $[3 \ 4 \ 12]$ then change the mode to cylindrical and you will see the vector as $[5.00 \ \angle \ 53.13 \ 12.00]$. Now change the mode to spherical and you will see the vector as $[13 \ \angle \ 53.13 \ \angle \ 22.62]$. Now enter the vector $[4 \ \angle \ -30 \ -3]$ by typing the sequence

LS [] 4 SPC AS RS 6 SPC 30 +/- SPC 3 +/- ENTER

and see the vector $[5.00 \ \angle \ -30.00 \ \angle \ 126.87]$. Although the vector was entered in cylindrical coordinates, it was immediately converted to spherical coordinates because the calculator is in spherical mode. If the angles are desired in radians, simply change the calculator to radian mode and the vector will become $[5 \ \angle \ -0.52 \ \angle \ 2.21]$.

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