If a line has the direction ratios -18, 12, -4, then what are its direction cosines?

Solution: Let

$$\mathbf{A} = \begin{pmatrix} -18 \\ 12 \\ -4 \end{pmatrix}.$$

The direction cosines of the line are the components of the unit vector in the direction of $\mathbf{A}$. To find this, we first calculate the norm of $\mathbf{A}$:

$$\|\mathbf{A}\| = \sqrt{(-18)^2 + 12^2 + (-4)^2} = \sqrt{324 + 144 + 16} = \sqrt{484} = 22.$$

Next, dividing each component of $\mathbf{A}$ by $\|\mathbf{A}\|$ gives the unit direction vector:

$$\frac{\mathbf{A}}{\|\mathbf{A}\|} = \frac{1}{22}\begin{pmatrix} -18 \\ 12 \\ -4 \end{pmatrix} = \begin{pmatrix} -\frac{9}{11} \\ \frac{6}{11} \\ -\frac{2}{11} \end{pmatrix}.$$

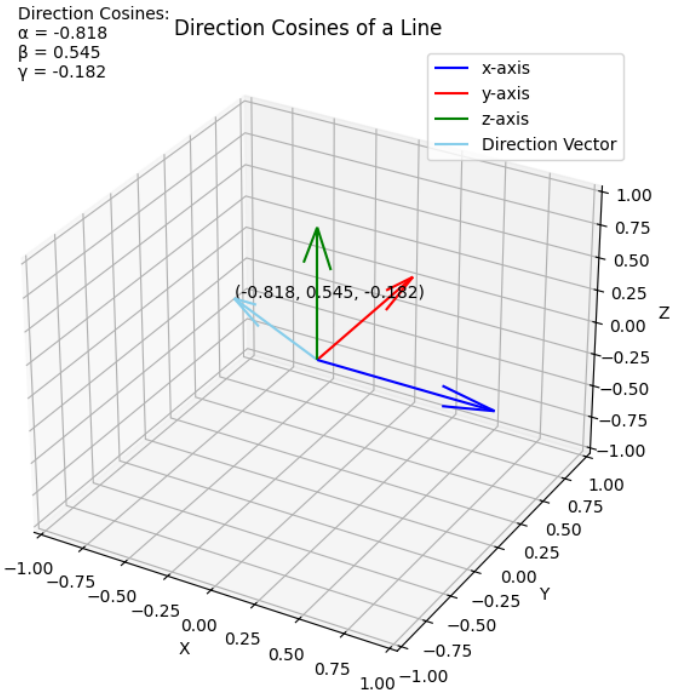

Fig. 1: plot