

# Matrix Theory (EE5609) Assignment 2

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**Abstract**—This assignment finds the equation of a straight line given two points on that line.

From the theory, using equation 2.0.1, the direction vector for the line through the points **O** and **P** is

$$\mathbf{A} = \mathbf{P} - \mathbf{O} \quad (3.0.1)$$

$$\Rightarrow \mathbf{A} = \begin{pmatrix} 5 \\ -2 \\ 3 \end{pmatrix} - \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \quad (3.0.2)$$

$$\Rightarrow \mathbf{A} = \begin{pmatrix} 5 \\ -2 \\ 3 \end{pmatrix} \quad (3.0.3)$$

From equation 2.0.2, the vector form of the line passing through **O** and **P**, which is the line passing through the point **O** and along direction vector **A** is given by

$$\mathbf{r} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} + k \begin{pmatrix} 5 \\ -2 \\ 3 \end{pmatrix} \quad (3.0.4)$$

$$\Rightarrow \mathbf{r} = k \begin{pmatrix} 5 \\ -2 \\ 3 \end{pmatrix} \quad (3.0.5)$$

where  $k$  is a constant multiple.

$$\mathbf{A} = \begin{pmatrix} a \\ b \\ b \end{pmatrix} = \begin{pmatrix} x_2 - x_1 \\ y_2 - y_1 \\ z_2 - z_1 \end{pmatrix} \quad (2.0.1)$$

The direction vector **A** for a line through the points  $\begin{pmatrix} x_1 \\ y_1 \\ z_1 \end{pmatrix}$  and  $\begin{pmatrix} x_2 \\ y_2 \\ z_2 \end{pmatrix}$  is given by

The vector form of equation of a line passing through a point with position vector **a** and along the direction vector **b** is given by

$$\mathbf{r} = \mathbf{a} + k\mathbf{b} \quad (2.0.2)$$

where  $k$  is a constant multiple.

## 3 SOLUTION

Let the points be  $\mathbf{O} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$  which is the origin and

$$\mathbf{P} = \begin{pmatrix} 5 \\ -2 \\ 3 \end{pmatrix}.$$

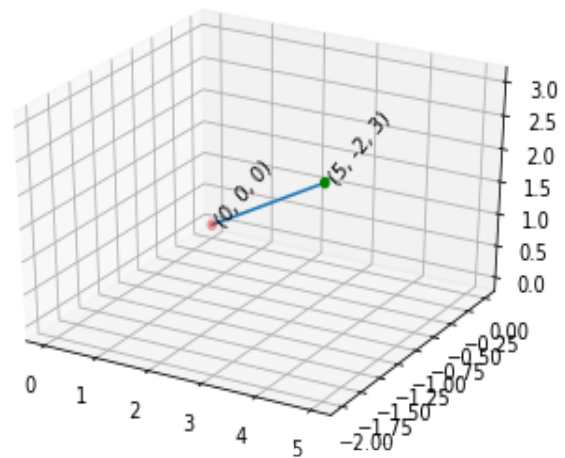


Fig. 1: Line passing through origin and point (5,-2,3)

**Python Code:** The code for generating the Figure 1 can be found at [https://github.com/Arko98/EE5609/blob/master/Assignment\\_2/Codes/Figure.py](https://github.com/Arko98/EE5609/blob/master/Assignment_2/Codes/Figure.py)