EE2802: Assignment4

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1 Problem

A line passes through $\begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ and $\begin{pmatrix} h \\ k \end{pmatrix}$. If the slope of the line is m, show that

$$k - y_1 = m\,(h - x_1) \tag{1.0.1}$$

2 Solution

let the direction vector of line joining $\mathbf{A} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} h \\ k \end{pmatrix}$ be $\mathbf{m}$

$$\mathbf{A} - \mathbf{B} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix} - \begin{pmatrix} h \\ k \end{pmatrix} \tag{2.0.1}$$

$$\implies \mathbf{m} = \begin{pmatrix} x_1 - h \\ y_1 - k \end{pmatrix} \tag{2.0.2}$$

$$\mathbf{m} = \begin{pmatrix} x_1 - h \\ y_1 - k \end{pmatrix} \tag{2.0.3}$$

Also, direction vector $\mathbf{m}$ is given as $\mathbf{m} = \begin{pmatrix} 1 \\ m \end{pmatrix}$, where m is the slope of the line.

$$\mathbf{m} = \begin{pmatrix} 1 \\ m \end{pmatrix} = \begin{pmatrix} x_1 - h \\ y_1 - k \end{pmatrix} \tag{2.0.4}$$

$$\implies y_1 - k = m\,(x_1 - h) \tag{2.0.5}$$