Assignment 2

Raja Asiwal

***Abstract*—This document explains the concept of a straight line equation that is parallel to a line and is passing through a point.**

Download the python code from

https://github.com/ee17btech11034/AI5106/blob/main/Assignment_2/AI_assignment_2.py

and latex-tikz codes from

https://github.com/ee17btech11034/AI5106/blob/main/Assignment_2/assignment_2.tex

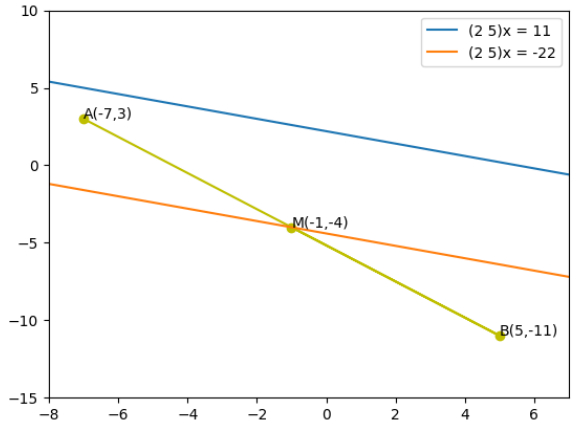

Fig. 0: Parallel Lines

1 Problem

Find the equation of a line parallel to $\begin{pmatrix}2 & 5\end{pmatrix}\mathbf{x} = 11$ passing through the middle point of the join of the points $\begin{pmatrix}-7\\3\end{pmatrix}, \begin{pmatrix}5\\-11\end{pmatrix}$.

2 Explanation

General equation of straight line is given by:

$$\mathbf{n}^T\mathbf{x} = c \tag{2.0.1}$$

n will be same because both lines are parallel.

$$\mathbf{n} = \begin{pmatrix}2\\5\end{pmatrix} \tag{2.0.2}$$

Passing through mid point M of A, B:

$$\mathbf{M} = \frac{\mathbf{A}+\mathbf{B}}{2} \tag{2.0.3}$$

$$\mathbf{n}^T(\mathbf{x}-\mathbf{M}) = 0 \tag{2.0.4}$$

$$\mathbf{n}^T\mathbf{x} = \mathbf{n}^T\mathbf{M} \tag{2.0.5}$$

3 Solution

So, the mid point M is :

$$\mathbf{M} = \frac{\begin{pmatrix}-7\\3\end{pmatrix}+\begin{pmatrix}5\\-11\end{pmatrix}}{2} = \begin{pmatrix}-1\\-4\end{pmatrix} \tag{3.0.1}$$

$$\mathbf{n}^T\mathbf{x} = \begin{pmatrix}2 & 5\end{pmatrix}\begin{pmatrix}-1\\-4\end{pmatrix} = -22 \tag{3.0.2}$$

So, the equation of line is :

$$\begin{pmatrix}2 & 5\end{pmatrix}\mathbf{x} = -22 \tag{3.0.3}$$