Parallel Lines

11^{th} Maths - Chapter 10

This is Problem-6 from Exercise 10.3

1. Find the distance between parallel lines

   (i) 15x+8y-34=0 and 15x+8y+31=0
   (ii) l(x+y)+p=0 and l(x+y)-r=0

1. solution for problem 1
   The given line can be expressed as

$$\begin{pmatrix}15 & 8\end{pmatrix}\mathbf{x} = -34 \tag{1}$$

$$\begin{pmatrix}15 & 8\end{pmatrix}\mathbf{x} = 31 \tag{2}$$

$$\mathbf{n} = \begin{pmatrix}15\\8\end{pmatrix}, c_1 = -34, c_2 = 31 \tag{3}$$

   distance between parallel lines

$$d = \frac{|c_1 - c_2|}{\|\mathbf{n}\|} \tag{4}$$

$$= \frac{|-34 - 31|}{\sqrt{289}} \tag{5}$$

$$= \frac{65}{17} \tag{6}$$

2. solution for problem 2

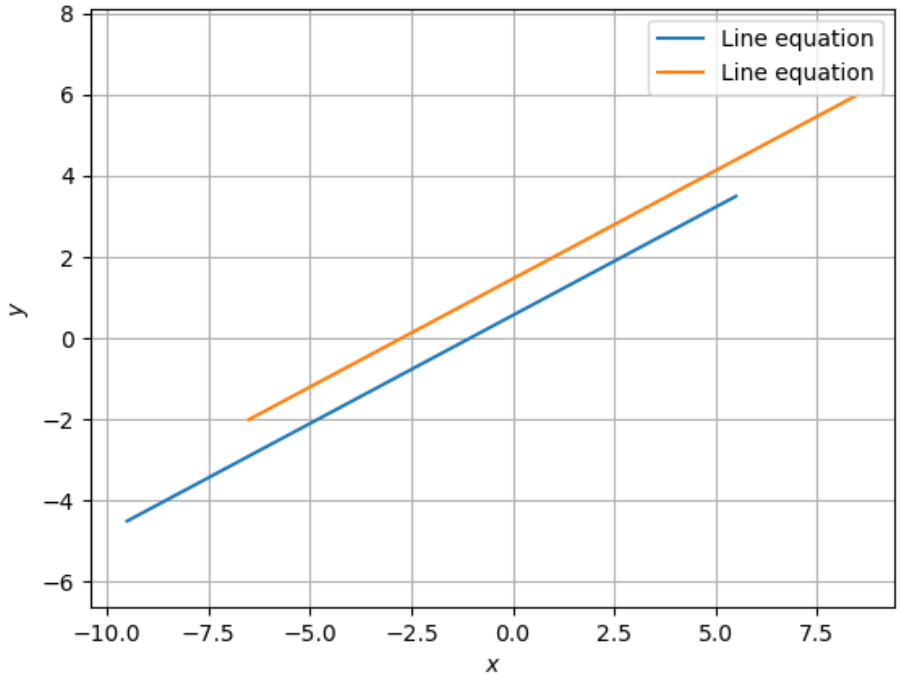

Figure 1

The given line can be expressed as

$$\mathbf{n} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \tag{7}$$

$$\begin{pmatrix} 1 & 1 \end{pmatrix} \mathbf{x} = \frac{-p}{l} \tag{8}$$

$$\begin{pmatrix} 1 & 1 \end{pmatrix} \mathbf{x} = \frac{-r}{l} \tag{9}$$

distance between parallel lines

$$d = \frac{1}{l\sqrt{2}}(p + r) \tag{10}$$

The distance between parallel lines is shown in figure 2 with normal

vector as

$$\mathbf{n} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \text{ and } c_1 = 1, c_2 = -1$$

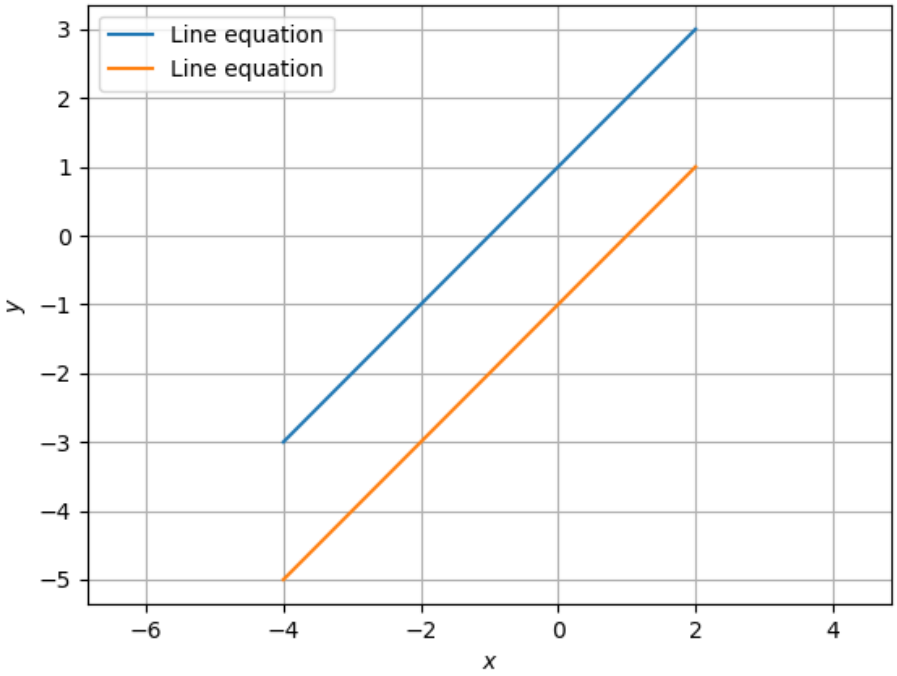

Figure 2