Straight Lines

11^{th} Maths - Chapter 10

This is Problem-3 from Exercise 10.2

1. Find the equation of line passing through $\begin{pmatrix}0\\0\end{pmatrix}$ with slope m.

   Solution: Line passing through point $\mathbf{A} = \begin{pmatrix}0\\0\end{pmatrix}$ is given by,

   $$\mathbf{n}^\top (\mathbf{x} - \mathbf{A}) = 0 \tag{1}$$

   Where,

   $$\mathbf{n} = \begin{pmatrix}m\\-1\end{pmatrix} \tag{2}$$
   $$\mathbf{n}^\top = \begin{pmatrix}m & -1\end{pmatrix} \tag{3}$$

   Substituting $\mathbf{A}$ and $\mathbf{n}$ in equation (1)

   $$\begin{pmatrix}m & -1\end{pmatrix}\left(\mathbf{x} - \begin{pmatrix}0\\0\end{pmatrix}\right) = 0 \tag{4}$$
   $$\begin{pmatrix}m & -1\end{pmatrix}\mathbf{x} - 0 = 0 \tag{5}$$
   $$\begin{pmatrix}m & -1\end{pmatrix}\mathbf{x} = 0 \tag{6}$$

   Line segment passing through $\begin{pmatrix}0\\0\end{pmatrix}$ with slope $m = 2$ is shown in Figure (1)

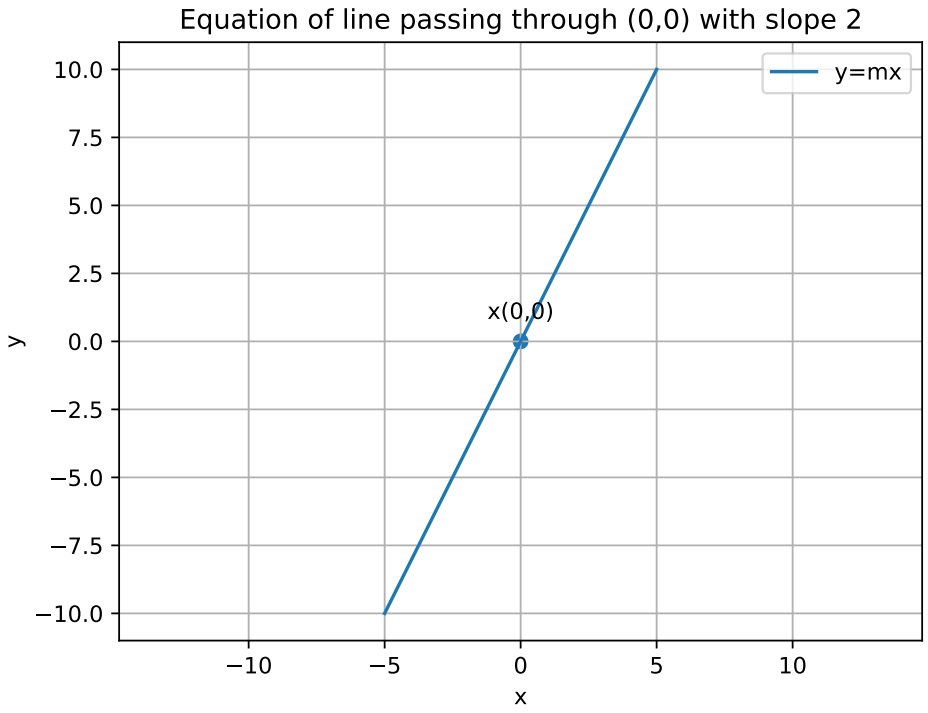
Equation of line passing through (0,0) with slope 2
y=mx
x(0,0)
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
y
−10
−5
0
5
10
x

Figure 1