Assignment - 1

Saiteja Chandragiri
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***Abstract*—This is a simple document to learn about vectors, matrices and constructions using latex, draw figures using Python, Latex.**

Download all python and latex-tikz codes from

```
svn co https://github.com/Chandragirisaiteja/
    assignment-1.git
```

1 Vectors

CBSE-Math-10-2008-QP-Math-X-2008-30-2-2-Q.19

1.1. Find a relation between x and y if the points $\mathbf{A} = \begin{pmatrix} x \\ y \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} and \mathbf{C} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$ are collinear.

Solution: Let

$$\mathbf{X} = \begin{pmatrix} x \\ y \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} and \mathbf{C} = \begin{pmatrix} 7 \\ 0 \end{pmatrix} \tag{1.1.1}$$

Then,

$$\mathbf{M} = \mathbf{B} - \mathbf{C} = \begin{pmatrix} -6 \\ 2 \end{pmatrix}, \tag{1.1.2}$$

and

$$\mathbf{N}^T\mathbf{M} = 0 \tag{1.1.3}$$

$$\implies \mathbf{N}^T \begin{pmatrix} -6 \\ 2 \end{pmatrix} = 0 \implies \mathbf{N}^T = \begin{pmatrix} 2 & 6 \end{pmatrix} \tag{1.1.4}$$

Equation of line is given by

$$\mathbf{N}^T(\mathbf{X} - \mathbf{B}) = 0 \tag{1.1.5}$$

$$\implies \mathbf{N}^T(\mathbf{X} - \begin{pmatrix} 1 \\ 2 \end{pmatrix}) = 0 \tag{1.1.6}$$

$$\begin{pmatrix} 2 & 6 \end{pmatrix}(\begin{pmatrix} x \\ y \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \end{pmatrix}) = 0 \tag{1.1.7}$$

$$\begin{pmatrix} 2 & 6 \end{pmatrix}\begin{pmatrix} x-1 \\ y-2 \end{pmatrix} = 0 \tag{1.1.8}$$

$$\implies 2x + 6y - 14 = 0 \tag{1.1.9}$$

$$\tag{1.1.10}$$

or

$$x + 3y - 7 = 0 \tag{1.1.11}$$

is the equation of the desired line.

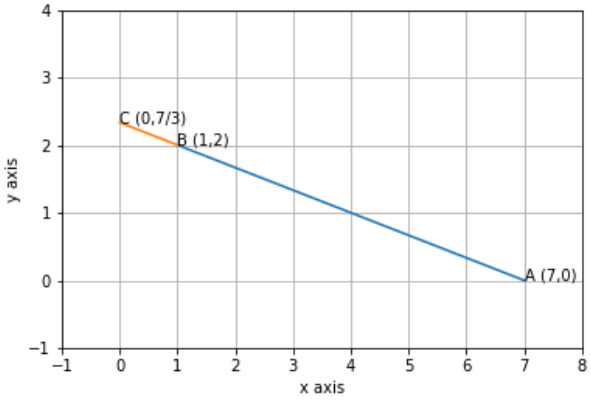

Fig. 1.1. Three points $\mathbf{A}, \mathbf{B}, \mathbf{C}$ are collinear

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