Assignment - 1

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MD/2020/705

***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 $\mathbf{A} = \begin{pmatrix} x \\ y \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} and \mathbf{C} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$

Solution: Let

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

Then,

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 1 - x \\ 2 - y \end{pmatrix}, \mathbf{C} - \mathbf{A} = \begin{pmatrix} 6 \\ -2 \end{pmatrix} \tag{1.1.2}$$

and

$$\mathbf{M} = \begin{pmatrix} \mathbf{B} - \mathbf{A} & \mathbf{C} - \mathbf{A} \end{pmatrix}^T \tag{1.1.3}$$

$$= \begin{pmatrix} 1 - x & 6 \\ 2 - y & -2 \end{pmatrix}^T \tag{1.1.4}$$

$$= \begin{pmatrix} 1 - x & 2 - y \\ 6 & -2 \end{pmatrix} \xleftrightarrow{R_1 \leftarrow \frac{R_1}{1-x}} \begin{pmatrix} 1 & \frac{2-y}{1-x} \\ 6 & -2 \end{pmatrix} \tag{1.1.5}$$

$$\xleftrightarrow{R_2 \leftarrow R_2 - 6R_1} \begin{pmatrix} 1 & \frac{2-y}{1-x} \\ 0 & \frac{2x+6y-14}{1-x} \end{pmatrix} \tag{1.1.6}$$

But, the points $\mathbf{A}, \mathbf{B}, \mathbf{C}$ are collinear. Rank($\mathbf{M}$=1

$$\implies \frac{2x + 6y - 14}{1 - x} = 0 \tag{1.1.7}$$

$$2x + 6y - 14 = 0 \tag{1.1.8}$$

or $x + 3y - 7 = 0$, which is the required relation between x and y.