## Matrices in Geometry 1.5.25

## EE25BTECH11037 - Divyansh

**Question:** In what ratio does the point  $\binom{\frac{24}{11}}{y}$  divide the line segment joining the points  $\mathbf{P} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$  and  $\mathbf{Q} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$ ? Also find the value of y.

**Given:**  $P\begin{pmatrix} 2 \\ -2 \end{pmatrix}$ ,  $Q\begin{pmatrix} 3 \\ 7 \end{pmatrix}$  and a point  $R\begin{pmatrix} \frac{24}{11} \\ y \end{pmatrix}$  on PQ. Let R divide PQ internally in the ratio  $\lambda$ : 1.

a) By section-formula,

$$\binom{\frac{24}{11}}{y} = \frac{\binom{2}{-2} + \lambda \binom{3}{7}}{1+\lambda}$$

b) Cross-multiplying

$$\begin{pmatrix} (\lambda+1)\frac{24}{11} \\ (\lambda+1)y \end{pmatrix} = \begin{pmatrix} 2+3\lambda \\ -2-7\lambda \end{pmatrix}$$

c) Solving for  $\lambda$  and cross-multiplying, we get

$$24\lambda + 24 = 22 + 33\lambda \implies 9\lambda = 2 \implies \lambda = \frac{2}{9}$$

d) Substituting the value of  $\lambda$  above, we get

$$y\left(\frac{2}{9}+1\right) = -2 + 7 \times \frac{2}{9} \implies 11y = -18 + 14 \implies y = \frac{-4}{11}$$

Hence, the final answer is  $\lambda = \frac{2}{9}$  and  $y = \frac{-4}{11}$ 

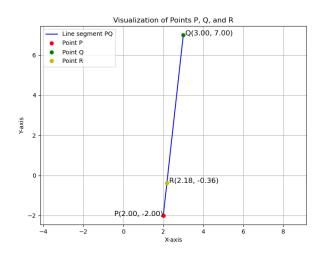


Fig. 1: Plot for 1.5.25