Matrices in Geometry - 1.5.25

EE25BTECH11037 Divyansh

Aug, 2025

1. Problem
2. Solution
3. Final Answer

Problem Statement

In what ratio does the point $\begin{pmatrix} \frac{24}{11} \\ y \end{pmatrix}$ 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.

Solution

$P\begin{pmatrix}2\\-2\end{pmatrix}$, $Q\begin{pmatrix}3\\7\end{pmatrix}$ 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,

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

b) Cross-multilying

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

Solution

c) Solving for λ 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 λ above, we get

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

Final Answer

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

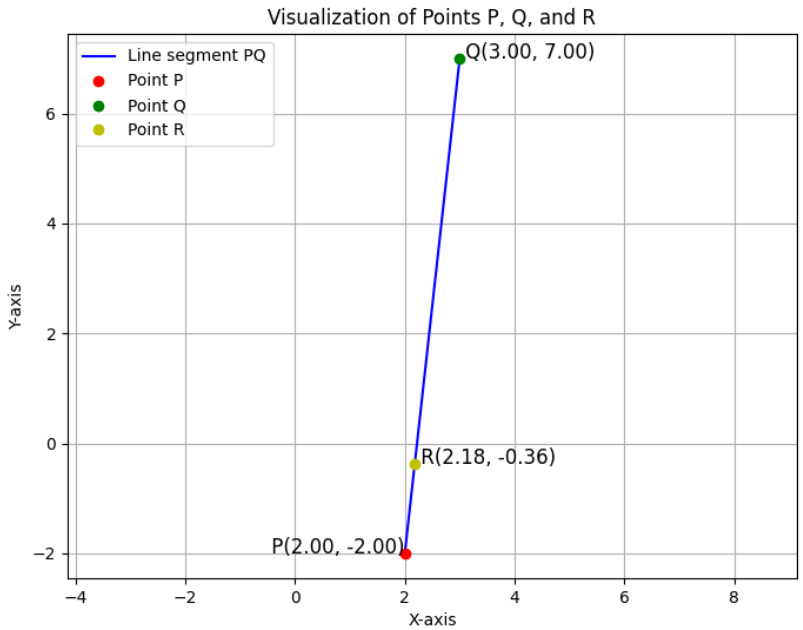

Figure: Plot for 1.5.25