2.7.9

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Question:
Find the area of the triangle whose vertices are $P(1,0)$, $Q(2,2)$ and $R(3,1)$.
Solution:
Let us solve the given equation theoretically and then verify the solution computationally
According to the question,
Given three points

$$\mathbf{P} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \mathbf{Q} = \begin{pmatrix} 2 \\ 2 \end{pmatrix} \mathbf{R} = \begin{pmatrix} 3 \\ 1 \end{pmatrix} \tag{0.1}$$

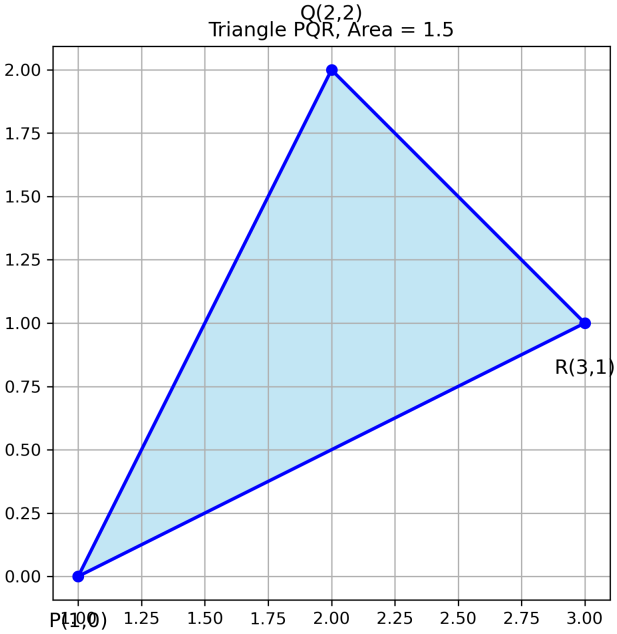
$$\mathbf{Q} - \mathbf{P} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \tag{0.2}$$

$$\mathbf{R} - \mathbf{P} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \tag{0.3}$$

$$ar(PQR) = \frac{1}{2} \|(\mathbf{Q} - \mathbf{P}) \times (\mathbf{R} - \mathbf{P})\| \tag{0.4}$$

$$ar(PQR) = \frac{1}{2} \|(\mathbf{Q} - \mathbf{P}) \times (\mathbf{R} - \mathbf{P})\| = \frac{3}{2} \tag{0.5}$$

From the figure it is clearly verified that the theoretical solution matches with the computational solution.


Q(2,2)
Triangle PQR, Area = 1.5
R(3,1)
P(1,0)
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00