1 NCERT 12.10.5.9

Find the position vector of a point R which divides the line joining two points P and Q whose Position Vectors are $2\vec{a}+\vec{b}$ and $\vec{a}-3\vec{b}$ externally in the ration $1:2$.Also, Show that P is the mid point of the line segment RQ

Construction steps:

1. Let us, Consider Point vectors and the ratio is

Symbol	value	Description
$\vec{OP}$	$2\vec{a}+\vec{b}$	point vector P
$\vec{OQ}$	$\vec{a}-3\vec{b}$	point vector Q

$$m:n=2:1 \tag{1}$$

For finding the position vector R,

$$\vec{OR}=\frac{2(2\vec{a}+\vec{b})-1(\vec{a}-3\vec{b})}{2-1} \tag{2}$$

$$\vec{OR}=\frac{4\vec{a}+2\vec{b}-\vec{a}+3\vec{b}}{1} \tag{3}$$

$$\vec{OR}=3\vec{a}+5\vec{b} \tag{4}$$

2. Now The point vectors P,Q and R are For showing P is the midpoint of

symbol	Value	Description
$\vec{OP}$	$2\vec{a}+\vec{b}$	point vector P
$\vec{OQ}$	$\vec{a}-3\vec{b}$	point vector Q
$\vec{OR}$	$3\vec{a}+5\vec{b}$	point vector R

the line segment RQ

$$\vec{OP}=\frac{\vec{OR}+\vec{OQ}}{2} \tag{5}$$

$$\vec{OP}=\frac{3\vec{a}+5\vec{b}+\vec{a}-3\vec{b}}{2} \tag{6}$$

$$\vec{OP}=2\vec{a}+\vec{b} \tag{7}$$

So,it is proved that P is the midpoint of RQ.

3. The Plot showing the Vector representation of the point vectors P,Q and R is

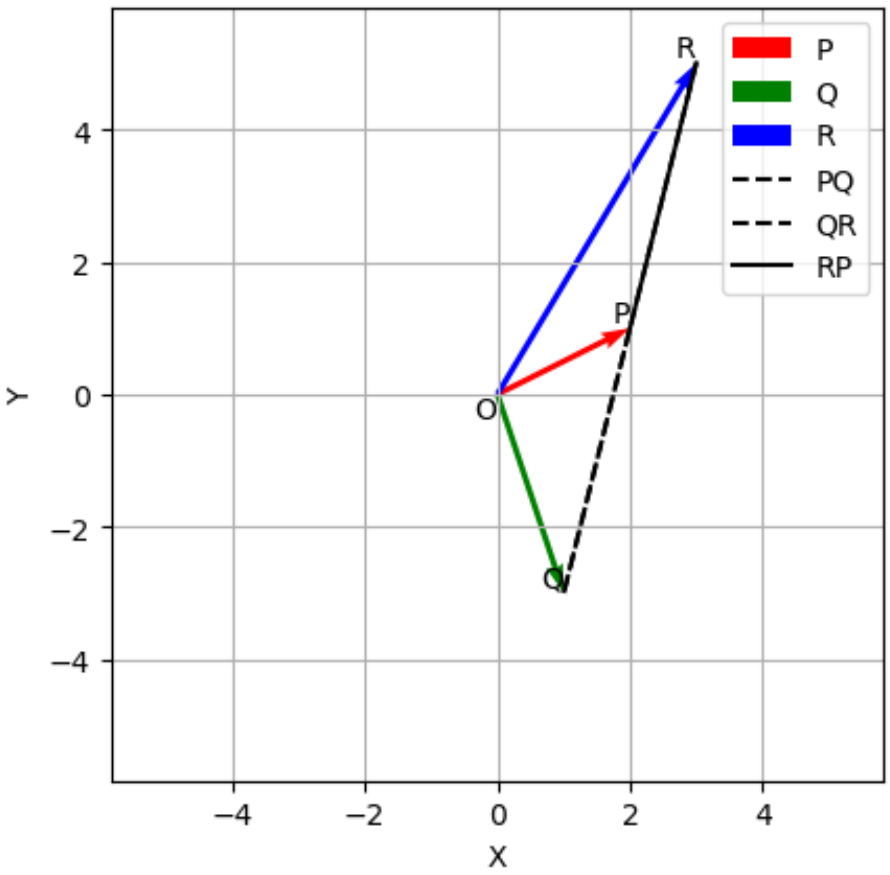

Figure 1: point vectors P,Q,R