9.2 Vectors in the Plane

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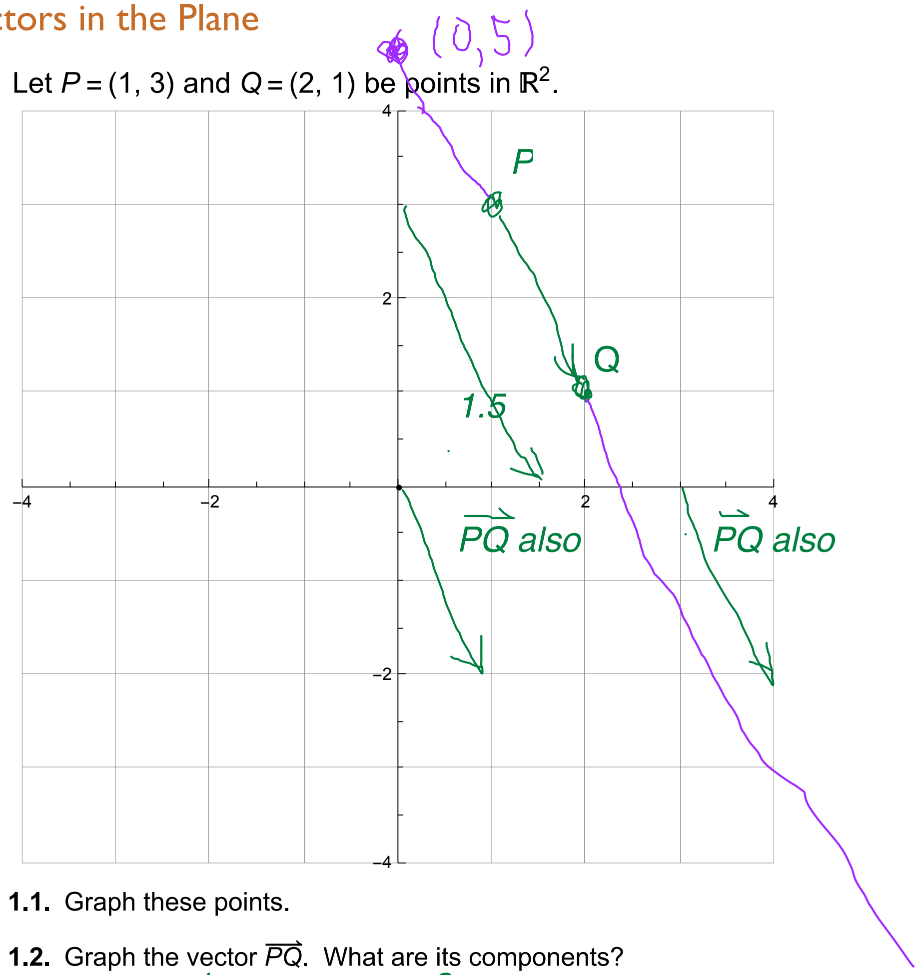
1. Let $P = (1, 3)$ and $Q = (2, 1)$ be points in $\mathbb{R}^2$.



1.1. Graph these points.

1.2. Graph the vector $\overrightarrow{PQ}$. What are its components?
$(\overrightarrow{PQ})_x \equiv c =$ 1 $\qquad (\overrightarrow{PQ})_y \equiv d =$ -2

1.3. Graph the equivalent vector with base at the origin.

1.4. Graph an equivalent vector that does not have its base at the origin.

1.5. Graph a *parallel vector that is not equivalent*.

1.6. *Determine the length* of the vector $\overrightarrow{PQ}$. *Explain why* this is the length.

Length is the square root of (x-component)^2 + (y-component)^2, so =sqrt((1)^2 +(-2)^2) = sqrt(5).

1.7. Draw the line that passes through the points P and Q.

1.8. Find the equation for this line in the form $y = m\,x + b$. y= -2 x + 5

1.9. Express m in terms of the components c and d of $\overrightarrow{PQ}$. m= d/c

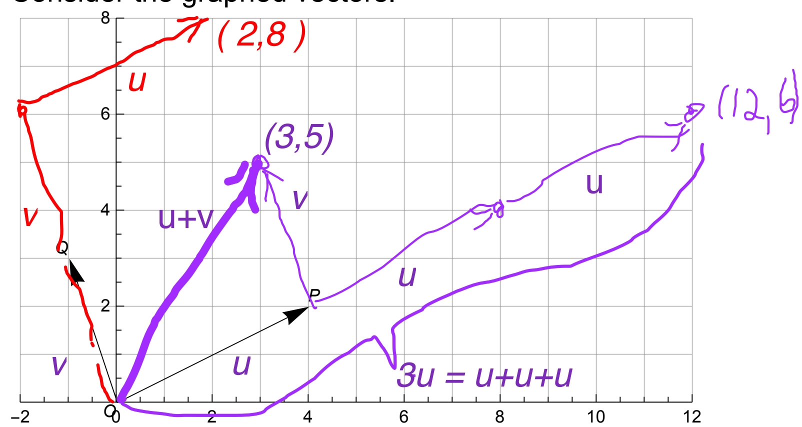
Find a *parametric* equation, in the form $\{(x(t), y(t)) = (a, b) + t(e, f) : 0 < t < 1\}$, describing the coordinates of the points on the line *segment* between *P* and *Q*. [Hint to get you started: when $t = 0$, you only have to worry about finding *a* and *b*.]

(x(t), y(t)) = (1,3) + t (1, -2)

when t=1, (x,y) = (1,3)+1*(1,-2) = (2,1) = Q

2. Consider the graphed vectors.

v



2.1. Find the components of the vectors $\boldsymbol{u} = \overrightarrow{OP}$ and $\boldsymbol{v} = \overrightarrow{OQ}$.

u=<__4__, __2__>

v=<__-1__, __3__>

u + v = <4,2> + <-1,3>= < 4-1, 2+3 >=< 3,5 >

2.2. Determine 3 ***u*** and ***u*** + ***v*** numerically and graphically.

3u = 3*< 4,2 >= < 3*4, 3*2 > = < 12, 6 >

2.3. Write $\boldsymbol{w} = \langle 2, 8 \rangle$ as a *linear combination* of ***u*** and ***v***. (A "linear combination" means adding and/or subtracting scalar multiples of of ***u*** and ***v***.)

See above, w = 2 v + u