9.2 Vectors in the Plane

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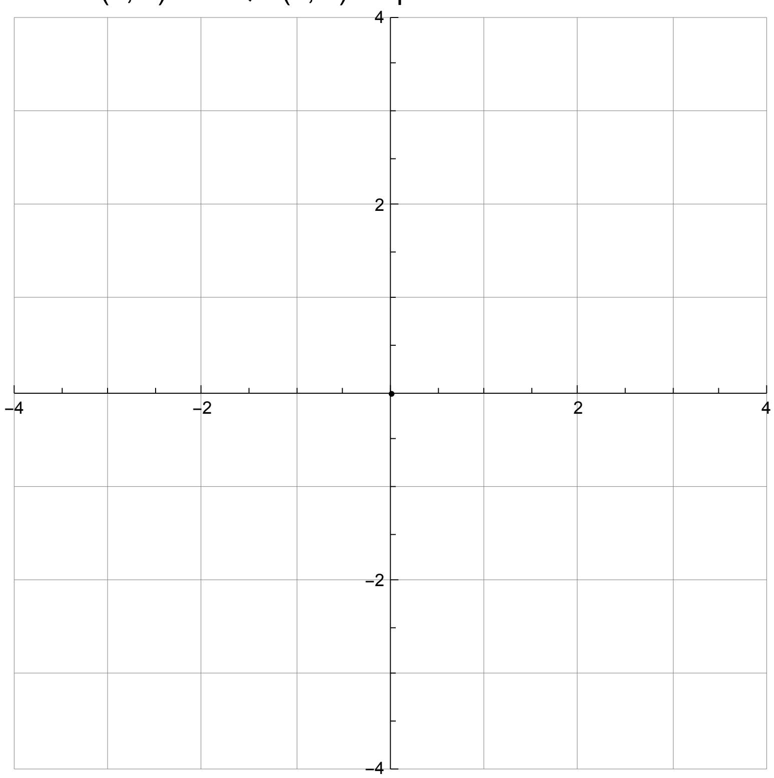
1. Let $P = (1, 3)$ and $Q = (2, 1)$ be points in $\mathbb{R}^2$.



1.1. Graph these points.

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

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.

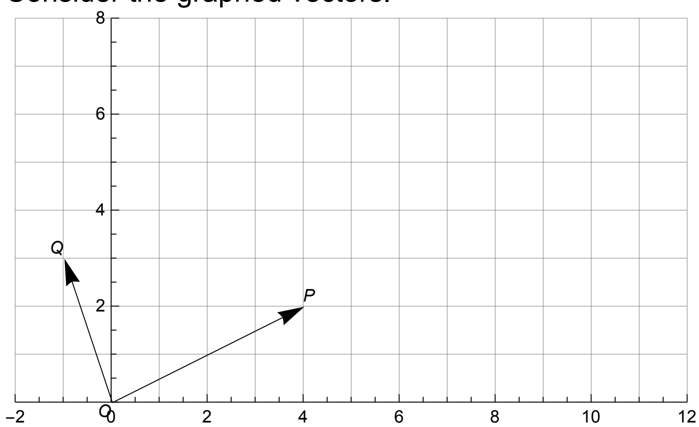
1.7. Draw the line that passes through the points P and Q.

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

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

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.]

2. Consider the graphed vectors.



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

u=<______, ______>

v=<______, ______>

2.2. Determine $3\,\boldsymbol{u}$ and $\boldsymbol{u} + \boldsymbol{v}$ numerically and graphically.

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