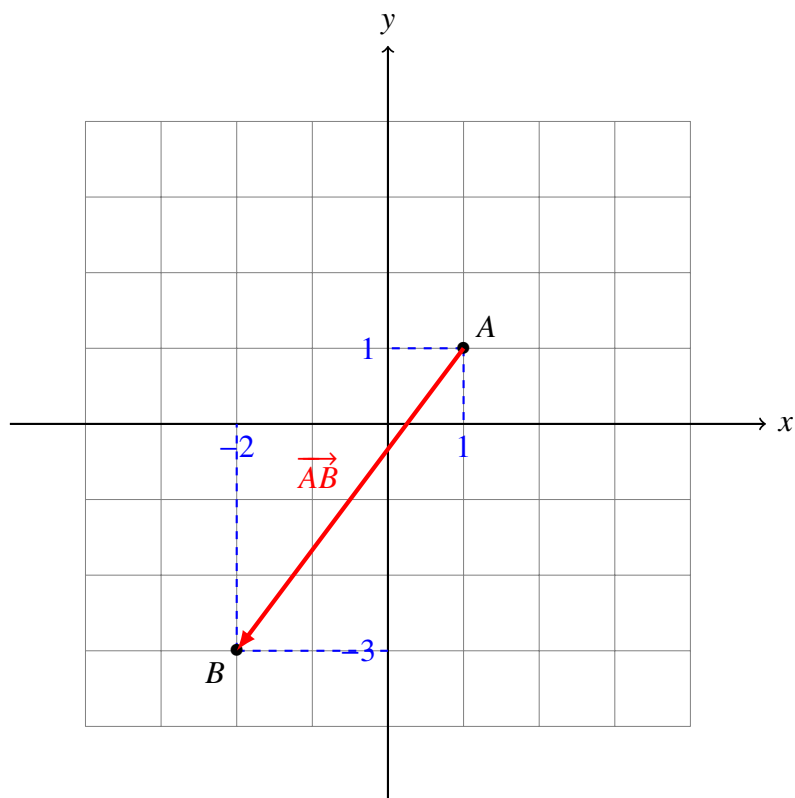


## Quiz #1 Solutions

### Problem 1.

(1)



(2)

$$\begin{aligned}\vec{AB} &= (x_B - x_A, y_B - y_A) \\ &= (-2 - 1, -3 - 1) \\ &= (-3, -4)\end{aligned}$$

(3)

$$\begin{aligned}\|\vec{AB}\| &= \sqrt{(-3)^2 + (-4)^2} \\ &= \sqrt{9 + 16} \\ &= 5\end{aligned}$$

(4) The unique unit vector having the same direction as  $\overrightarrow{AB}$  is the vector  $\overrightarrow{u}_1$  given by

$$\begin{aligned}\overrightarrow{u}_1 &= \frac{\overrightarrow{AB}}{\|\overrightarrow{AB}\|} \\ &= \frac{(-3, -4)}{5} \\ &= \left(-\frac{3}{5}, -\frac{4}{5}\right)\end{aligned}$$

Another unit vector parallel to  $\overrightarrow{AB}$  (in fact the only other one) is  $\overrightarrow{u}_2 = -\overrightarrow{u}_1$ , that is:

$$\overrightarrow{u}_2 = \left(\frac{3}{5}, \frac{4}{5}\right)$$

(5) We can take the vectors  $\overrightarrow{v}_1 = 2\overrightarrow{u}_1$  and  $\overrightarrow{v}_2 = -2\overrightarrow{u}_1$  (in fact these are the only solutions), that is:

$$\begin{aligned}\overrightarrow{v}_1 &= \left(-\frac{6}{5}, -\frac{8}{5}\right) \\ \overrightarrow{v}_2 &= \left(\frac{6}{5}, \frac{8}{5}\right)\end{aligned}$$

**Problem 2** (~ 5 points.). True or False? *No explanations required.*

- (1) False [This is only true when  $\overrightarrow{u}$  and  $\overrightarrow{v}$  have same direction]
- (2) True [This follows from the distributive properties of operations on vectors]
- (3) True [Any unit vector can be obtained this way]
- (4) True [This is one of the properties of scalar multiplication]
- (5) False [This is true if all three vectors are non-null, but if  $\overrightarrow{v}$  is the null vector,  $\overrightarrow{u}$  and  $\overrightarrow{w}$  could be any vectors]