Homework 24-11

2U: Graphing Techniques

Complete the homework quiz – given that it is assessment period, I will give you a couple of weeks to complete this quiz. It will close on 8 Dec.

3U: Vectors

Write down the following using column vector notation $\begin{bmatrix} x \\ y \end{bmatrix}$.

(a) $\underset{\sim}{i} + 2\underset{\sim}{j}$

(b) $-2\underset{\sim}{i} + 3\underset{\sim}{j}$

(c) $-\underset{\sim}{i} + 5\underset{\sim}{j}$

(d) $-\frac{1}{2}\underset{\sim}{i} + \frac{5}{2}\underset{\sim}{j}$

Let $A = (2, 4)$ and $B = (5, 3)$.

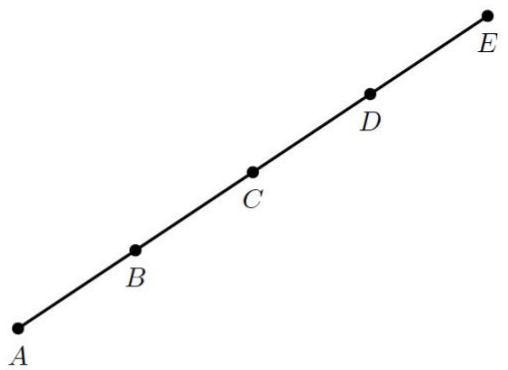
(a) Draw the displacement vector $\overrightarrow{AB}$.

(b) Draw the position vector $\overrightarrow{AB}$.

(c) Write down the representation of $\overrightarrow{AB}$ in the form $a\underset{\sim}{i} + b\underset{\sim}{j}$ and $\begin{bmatrix} a \\ b \end{bmatrix}$.

Let $\mathbf{u} = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$. Find constants a and b such that $a\mathbf{u} + b\mathbf{v} = \begin{bmatrix} 11 \\ 7 \end{bmatrix}$

The diagram below shows a line segment AE with three points in between B, C and D such that the interval AE is split into four equal intervals.



Let $\overrightarrow{AC} = \mathbf{u}$. Find the following in terms of $\mathbf{u}$.

(a) $\overrightarrow{AB}$

(b) $\overrightarrow{DC}$

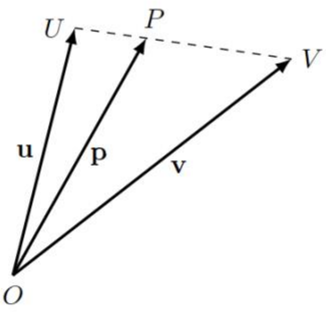
(c) $\overrightarrow{BD}$

(d) $\overrightarrow{EC}$

(e) $\overrightarrow{BE}$

(f) $\overrightarrow{DA}$

The diagram below shows a point P on an interval UV, which is twice as far from V as it is from U. Let $\mathbf{u} = \overrightarrow{OU}$, $\mathbf{v} = \overrightarrow{OV}$ and $\mathbf{p} = \overrightarrow{OP}$.



(a) Write down the vector that represents $\mathbf{u} + \overrightarrow{UV}$.

(b) Write down the vector that represents $\mathbf{u} + \overrightarrow{UP}$.

(c) Deduce that $\mathbf{p} = \frac{2}{3}\mathbf{u} + \frac{1}{3}\mathbf{v}$.

Let $\mathbf{a} = \underset{\sim}{i} + 5\,\underset{\sim}{j}$, $\mathbf{b} = 3\,\underset{\sim}{i} - 2\,\underset{\sim}{j}$ and $\mathbf{c} = -2\,\underset{\sim}{i} - 4\,\underset{\sim}{j}$. Calculate the following.

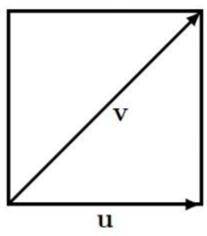
(a)	$\lvert\mathbf{a}\rvert$	(c)	$\lvert\mathbf{b}\rvert$	(e)	$\lvert\mathbf{a} - \mathbf{b}\rvert$	(g)	$\lvert\hat{\mathbf{a}}\rvert$
(b)	$\lvert -\mathbf{a}\rvert$	(d)	$\lvert\mathbf{c}\rvert$	(f)	$\lvert\mathbf{b} - \mathbf{a}\rvert$	(h)	$\lvert\hat{\mathbf{b}}\rvert$

(a) If $|\mathbf{a}| = 3$, $|\mathbf{b}| = 4$, and the angle between $\mathbf{a}$ and $\mathbf{b}$ is $\frac{\pi}{3}$, find $\mathbf{a} \cdot \mathbf{b}$.

(b) If $|\mathbf{a}| = 3$, $|\mathbf{b}| = 4$, and the angle between $\mathbf{a}$ and $\mathbf{b}$ is $\frac{2\pi}{3}$, find $\mathbf{a} \cdot \mathbf{b}$.

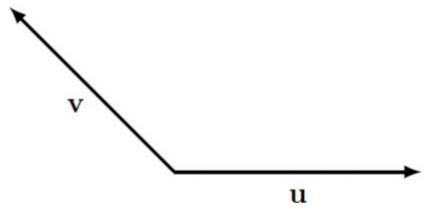
(c) If $|\mathbf{a}| = 2$, $|\mathbf{b}| = 1$, and the angle between $\mathbf{a}$ and $\mathbf{b}$ is $\frac{\pi}{2}$, find $\mathbf{a} \cdot \mathbf{b}$.

The diagram below shows a unit vector $\mathbf{u}$ being one of the sides of a square, and $\mathbf{v}$ being the diagonal of the square.



Calculate $\mathbf{u} \cdot \mathbf{v}$.

The diagram below shows two vectors $\mathbf{u}$ and $\mathbf{v}$. Draw the



(a) vector projection of $\mathbf{u}$ onto $\mathbf{v}$.

(b) vector projection of $\mathbf{v}$ onto $\mathbf{u}$.

For the following pairs of vectors $\mathbf{u}$ and $\mathbf{v}$, find the vector projection of $\mathbf{u}$ onto $\mathbf{v}$.

(a) $\mathbf{u} = \underset{\sim}{i} + 4\underset{\sim}{j}$, $\mathbf{v} = 3\underset{\sim}{i} + 6\underset{\sim}{j}$

(b) $\mathbf{u} = -3\underset{\sim}{i} + \underset{\sim}{j}$, $\mathbf{v} = 2\underset{\sim}{i} + 4\underset{\sim}{j}$

(c) $\mathbf{u} = -4\underset{\sim}{i} + 3\underset{\sim}{j}$, $\mathbf{v} = -2\underset{\sim}{i} - \underset{\sim}{j}$

(d) $\mathbf{u} = 2\underset{\sim}{i} - 5\underset{\sim}{j}$, $\mathbf{v} = 4\underset{\sim}{i} - 3\underset{\sim}{j}$