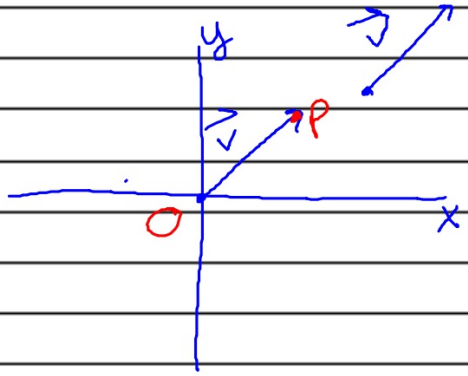
Questions:	Notes:

POSITION VECTORS

9/6/17

A POSITION VECTOR IS ONE WHOSE TAIL HAS BEEN PLACED AT THE ORIGIN
- IT IS IN STANDARD POSITION



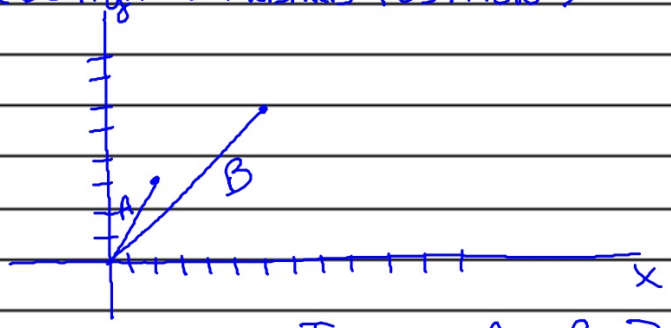
THE POINT P WITH COORDINATES (x, y) HAS POSITION VECTOR

$$\overrightarrow{OP} = \begin{pmatrix} x \\ y \end{pmatrix} = x\mathbf{i} + y\mathbf{j}$$

Questions:	Notes:

RESULTANT VECTORS

CONSIDER POINTS A (2,3) AND B (6,6)
(BOTH AT STANDARD POSITION)

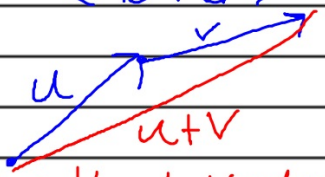


WHAT HAPPENS IF I ADD A + B ?

ADDITION OF VECTORS $u = \begin{pmatrix} a \\ b \end{pmatrix}, v = \begin{pmatrix} c \\ d \end{pmatrix}$

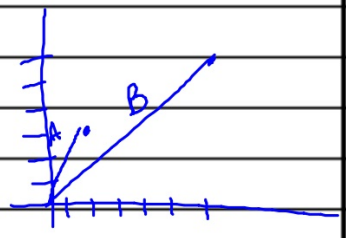
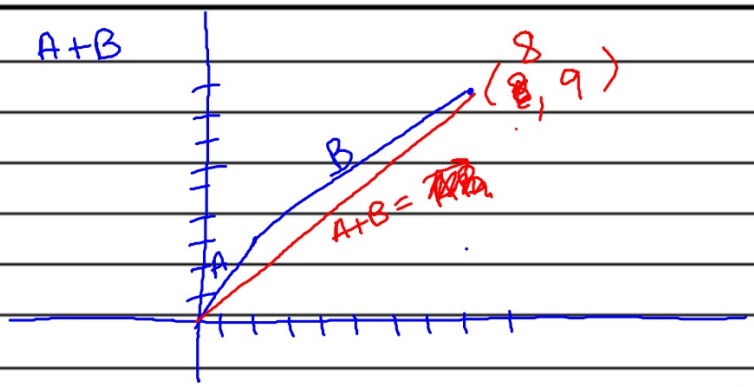
Algebra: $u + v = \begin{pmatrix} a+c \\ b+d \end{pmatrix}$

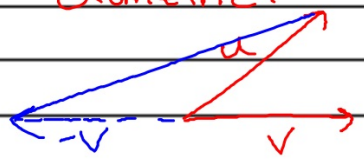
Geometric:



attach tail of v to end of u

$\overrightarrow{u+v}$ is the Resultant Vector

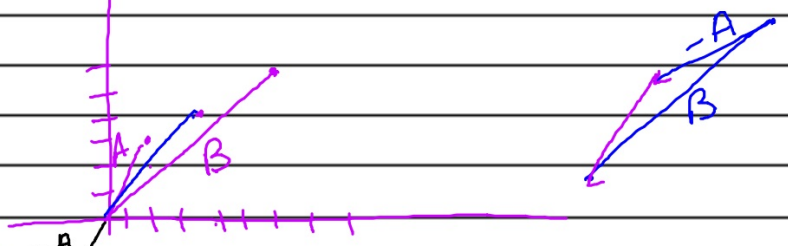
Questions:	Notes:
	A+B 
	$A+B=\begin{pmatrix}2\\3\end{pmatrix}+\begin{pmatrix}6\\6\end{pmatrix}=\begin{pmatrix}2+6\\3+6\end{pmatrix}=\begin{pmatrix}8\\9\end{pmatrix}$
	You try $A=\begin{pmatrix}-1\\7\end{pmatrix}$ $B=\begin{pmatrix}3\\5\end{pmatrix}$
	just Algebraically $\overrightarrow{AB}=\begin{pmatrix}2\\12\end{pmatrix}$

Questions:	Notes:
	SUBTRACTION: $u = \begin{pmatrix} a \\ b \end{pmatrix}$ and $v = \begin{pmatrix} c \\ d \end{pmatrix}$
	Algebra: $u - v = \begin{pmatrix} a-c \\ b-d \end{pmatrix}$
	Geometric:  make v negative
	now: connect the endpoints of u and $-v$
	TO FIND THE RESULTANT VECTOR $\overrightarrow{AB}$ BETWEEN TWO POINTS A AND B WE CAN SUBTRACT THE POSITION VECTOR A FROM THE POSITION VECTOR B.

Questions:	Notes:

$\overrightarrow{AB} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ From A to B

Measure



$\overrightarrow{AB} = B - A = \begin{pmatrix} 6 \\ 6 \end{pmatrix} - \begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$

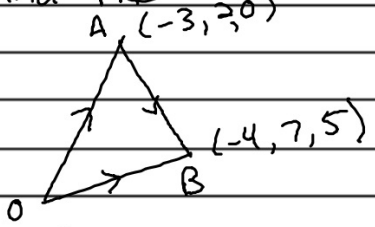
From O to A, then O to B

Thus $\overrightarrow{AB} = \overrightarrow{OA} + \overrightarrow{OB}$

recall $\overrightarrow{AB} = -\overrightarrow{OA}$

then $\overrightarrow{AB} = -\overrightarrow{OA} + \overrightarrow{OB}$

$= \overrightarrow{OB} - \overrightarrow{OA}$

Questions:	Notes:
	Ex) Points A and B have coordinates $(-3,2,0)$ and $(-4,7,5)$
	Find $\overrightarrow{AB}$
	
	$\overrightarrow{OA} = \begin{pmatrix} -3 \\ 2 \\ 0 \end{pmatrix}$ and $\overrightarrow{OB} = \begin{pmatrix} -4 \\ 7 \\ 5 \end{pmatrix}$
	$\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} = \begin{pmatrix} -4 \\ 7 \\ 5 \end{pmatrix} - \begin{pmatrix} -3 \\ 2 \\ 0 \end{pmatrix} = \begin{pmatrix} -1 \\ 5 \\ 5 \end{pmatrix}$

Ex 2) $\overrightarrow{XY} = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix}$ and $\overrightarrow{XZ} = \begin{pmatrix} 0 \\ -10 \\ -1 \end{pmatrix}$

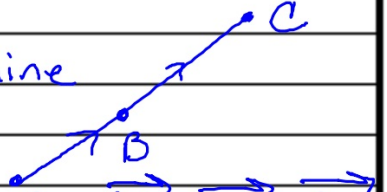
a. $\overrightarrow{YZ} =$

$\overrightarrow{YZ} = \overrightarrow{XZ} - \overrightarrow{XY} = \begin{pmatrix} 0 \\ -10 \\ -1 \end{pmatrix} - \begin{pmatrix} 2 \\ 1 \\ -3 \end{pmatrix} = \begin{pmatrix} -2 \\ -11 \\ 2 \end{pmatrix}$

Questions:	Notes: Practice from 12C
	#1. P has coordinates (7,4) and Q (2,3) Find $\overrightarrow{PQ}$ and $\overrightarrow{QP}$
	$\overrightarrow{PQ} = \overrightarrow{Q} - \overrightarrow{P} = \overrightarrow{OQ} - \overrightarrow{OP}$
	$= \begin{pmatrix} 2 \\ 3 \end{pmatrix} - \begin{pmatrix} 7 \\ 4 \end{pmatrix} = \begin{pmatrix} -5 \\ -1 \end{pmatrix}$
	in terms of i and j
	$\overrightarrow{OQ} - \overrightarrow{OP} = (2-7)i + (3-4)j = -5i - j$
	$\overrightarrow{P} = 7i + 4j$
	$\overrightarrow{Q} = 2i + 3j$
	TRY: Find $\overrightarrow{QP} = \begin{pmatrix} -5 \\ -1 \end{pmatrix}$
	$= \begin{pmatrix} 7 \\ 4 \end{pmatrix} - \begin{pmatrix} 2 \\ 3 \end{pmatrix} = 5i + j$

Questions:	Notes:
	#3 write in $ai+bj+ck$
	a. $\overrightarrow{OP}$ where P is $(2,-3,5)$
	$\overrightarrow{OP} = 2i-3j+5K$
	b. the vector joining $(3,-1,4)$ to the origin (asking for $\overrightarrow{RO}$)
	Origin − vector
	$= \begin{pmatrix}0\\0\\0\end{pmatrix} - \begin{pmatrix}3\\-1\\4\end{pmatrix} = -3i+j-4$
	c. the vector from $(3,-1,4)$ to $(1,2,5$
	$= \begin{pmatrix}1\\2\\5\end{pmatrix} - \begin{pmatrix}3\\-1\\4\end{pmatrix} = \begin{pmatrix}-2\\3\\1\end{pmatrix}$
	HW 12C p. 416 #2-6

Questions:	Notes:
	Ex) $\vec{A} = 3i + 2j - 3K$
	$\vec{B} = 2i + j - 5K$
	find $\vec{BA} = \vec{OA} - \vec{OB}$
	$= (3-2)i + (2-1)j + (-3-\,-5)K$
	$= i + j + 2K$
	COLINEAR VECTORS
	vectors on the same line
	- If two or more vectors are on the same line (colinear), They will be parallel, and be scalar multiples of each other



$\vec{AB}, \vec{BC}, \vec{AC}$

$-\vec{AB}, -\vec{BC}, -\vec{AC}$

Questions:	Notes:
HW 12D p.417 #1-3	**Ex)** Show that A, B, C with position vectors $i-2j+3k$, $-2i+3j-k$, $4i-7j+7k$ are colinear Plan: start by finding the vector joining any 2 of the points ie. show that $\overrightarrow{AB}$ and $\overrightarrow{BC}$ are scalar multiples of each other $\Rightarrow$ parallel $\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} = \begin{pmatrix} -2 \\ 3 \\ -1 \end{pmatrix} - \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix} = \begin{pmatrix} -3 \\ 5 \\ -4 \end{pmatrix}$ $= -3i+5j-4k$ now repeat with any other two vectors / points $\overrightarrow{BC} = 6i-10j+8k$ $\overrightarrow{AB} = -\frac{1}{2}\overrightarrow{BC} \Rightarrow \overrightarrow{AB} \parallel \overrightarrow{BC}$ Since they are scalar multiples of each other, And, since they both contain the point B, they are colinear