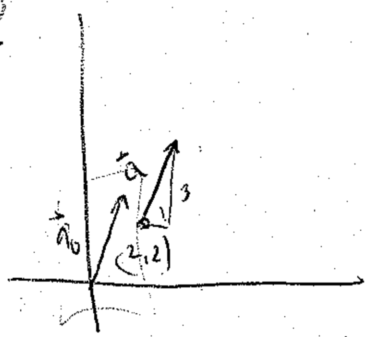
3

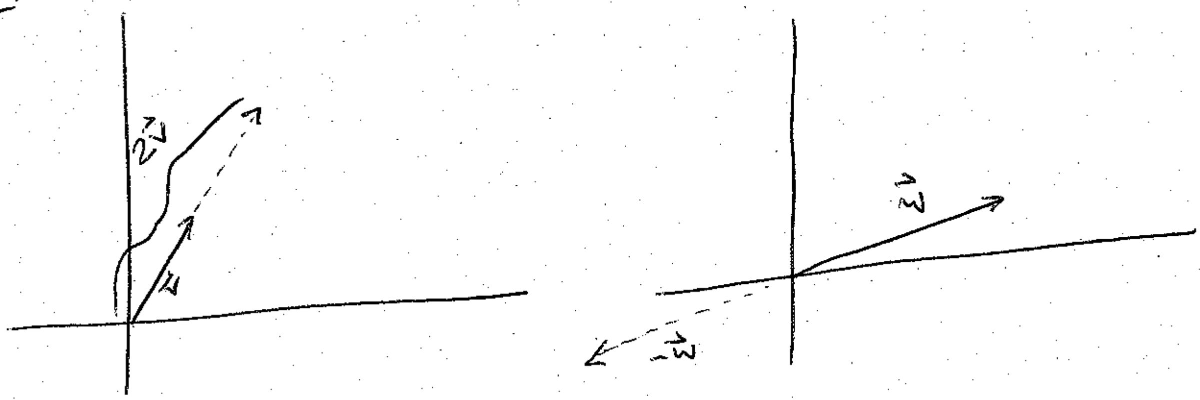


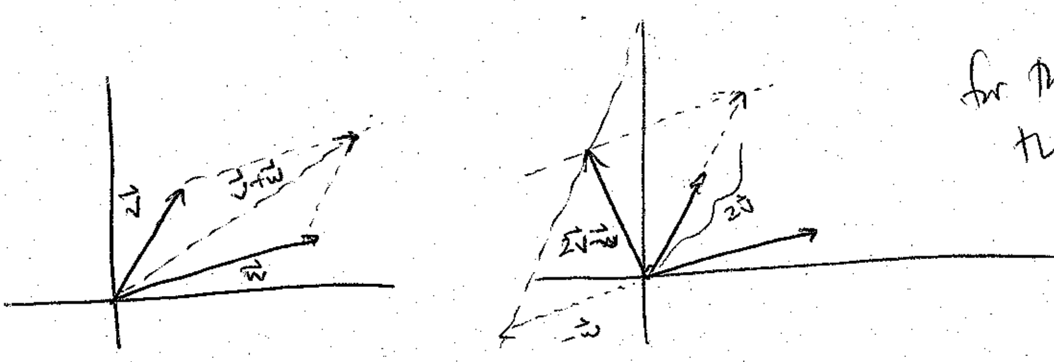
The terminal point of $\vec{a}$ based at (2,2) is $\boxed{(3,5)}$ (notice that (3,5) is right but $\langle 3,5\rangle$ is wrong).

9 $\langle 2,1\rangle + \langle 3,4\rangle$ vectors add componentwise so

$$\langle 2,1\rangle + \langle 3,4\rangle = \boxed{\langle 5,5\rangle}.$$

17





for this last one, I built the vector $2\vec{v}$, the vector $-\vec{w}$ and added $2\vec{v}$ and $-\vec{w}$ with the parallelogram law.

31 $\vec{AB} = \langle 3-1, 4-1\rangle = \langle 2,3\rangle$

$\cancel{A}\vec{PQ} = \langle 7-1, 10-1\rangle = \langle 6,9\rangle = 3\langle 2,3\rangle$.

Since $\vec{PQ} = 3\vec{AB}$, the vectors are parallel.

Since $3>0$, they point in the same direction

35 Let $P=(a,b)$. I want

$\vec{PR} = \langle -2,7\rangle$

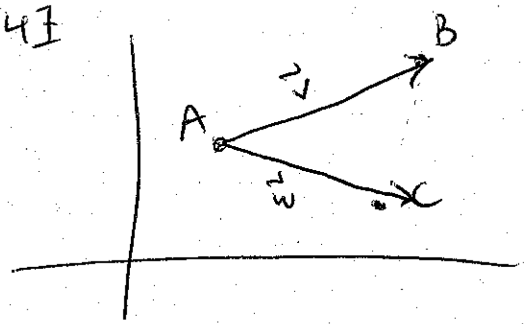
So $\vec{PR} = \langle -2-a, 7-b\rangle = \langle -2,7\rangle$

$\Rightarrow$ ~~so~~ $-2-a=-2$, $7-b=7$ $\Rightarrow$ $a,b=0$

$\Rightarrow P=(0,0)$.

(You might have been able to see this right away, too).

47



(a) $-\vec{w}$ is the vector from C to A.

So (a) $\longleftrightarrow$ (ii)

$-\vec{v}$, likewise,

(b) $\longleftrightarrow$ (iv)

$\vec{w}-\vec{v} = \vec{w}+(-\vec{v})$ so flip $\vec{v}$ and connect tail to head

(c) $\longleftrightarrow$ (iii)

Similarly (d) $\longleftrightarrow$ (i)

55

$u = \langle 3,-1\rangle = r\langle 2,1\rangle + s\langle 1,3\rangle$

$\Rightarrow \langle 3,-1\rangle = \langle 2r, r\rangle + \langle s, 3s\rangle$

$= \langle 2r+s, r+3s\rangle$

$\Rightarrow \quad 3 = 2r+s \qquad \Rightarrow \quad 3 = 2r+s$

$\quad\;\; -1 = r+3s \qquad\quad\;\; 2 = -2r-6s$

$\Rightarrow 5 = -5s \Rightarrow s = -1$

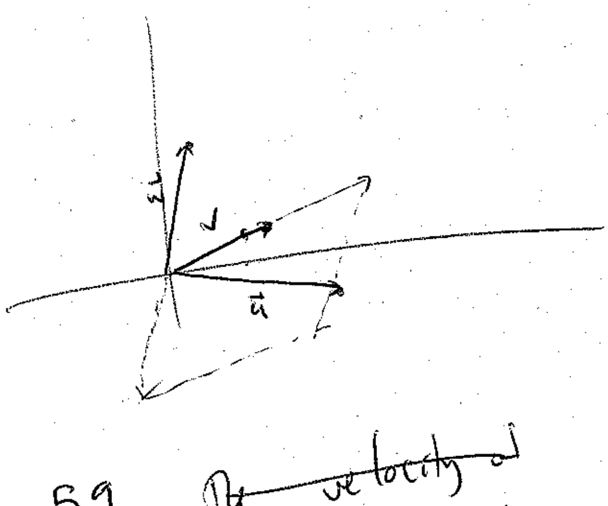
$\Rightarrow r = 2.$

So $\boxed{2\langle 2,1\rangle - \langle 1,3\rangle = \langle 3,-1\rangle.}$

Check:

$4-1 = 3$ ✓

$2-3 = -1$ ✓.



59 ~~The velocity of~~

Let the origin be at the nose of the plane. Then,

$v_1 = \langle 200, 0\rangle$

$v_2 = \langle a,a\rangle$ and $\|v_2\| = 40$. Since the length of a vector $\langle a,a\rangle = 2a^2$, we get $2a^2 = 40^2 \Rightarrow a = \sqrt{800} = 20\sqrt{2}$.

So $v = v_1 + v_2 = \langle 200, 0\rangle + \langle 20\sqrt{2}, 20\sqrt{2}\rangle = \langle 200+20\sqrt{2}, 20\sqrt{2}\rangle$

and $\boxed{\|v\| = 230 \text{ mph.}}$