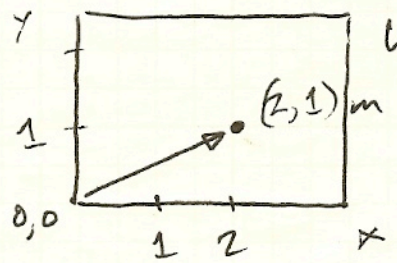
3.3



a. Fly's distance from origin.

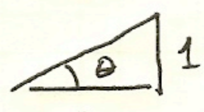
Use Pythagoras' Theorem:

$c^{\cancel{2}} = \sqrt{a^2 + b^2}$; $a = 2.00$; $b = 1.00$

$\sqrt{2^2 + 1^2} = \sqrt{5} = \boxed{2.24\,m}$

b. Polar coordinates are based on a vector w/ magnitude (calculated above) & direction.

Using trig to get direction = angle relative to 0° (East).



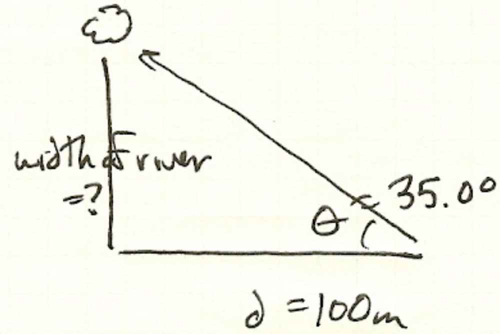
$\tan\theta = \frac{opp.}{adj}$

$\theta = \tan^{-1}\left(\frac{1}{2}\right)$

$\theta = \underline{26.6°}$

Polar coordinates are $\boxed{2.24\,m \;@\; 26.6°}$

3.7



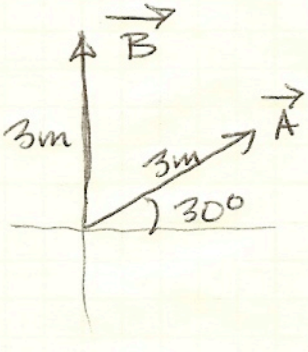
Determine width of river using trig:

$$\tan\theta = \frac{opp}{adj}$$

$$\tan 35 = \frac{width}{100m}$$

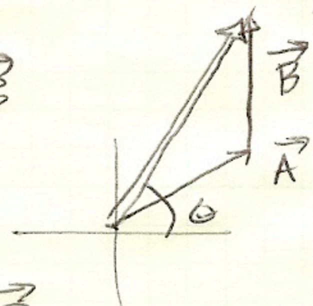
$$width = \boxed{70.0m}$$

3.11



Graphical analysis requires adding vectors by physically drawing them tip-to-tail on the page & measuring the resultant magnitude & direction w/ a ruler & protractor.

a. $\vec{A} + \vec{B}$

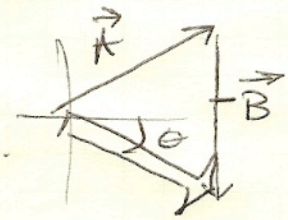


Resultant (measured) =

$\boxed{5.2\text{m} @ 60°}$

b. $\vec{A} - \vec{B}$

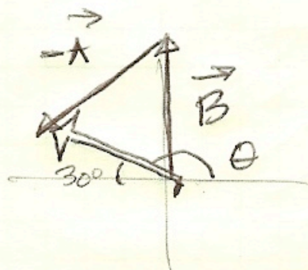
↑ add negative B vector.



Resultant =

$\boxed{3.0\text{m} @ -30°}$

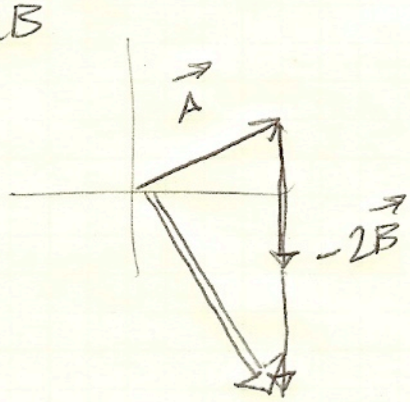
c. $\vec{B} - \vec{A}$



Resultant =

$\boxed{3.0\text{m} @ \ 180-30} = \boxed{150°}$

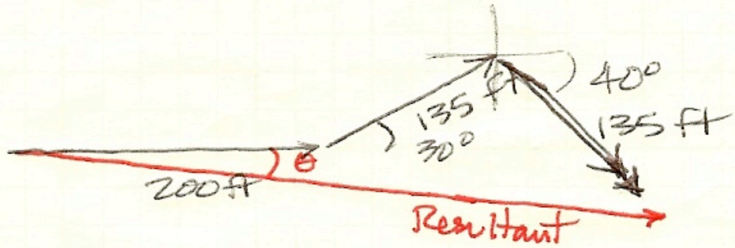
d. $\vec{A} - 2\vec{B}$



Resultant =

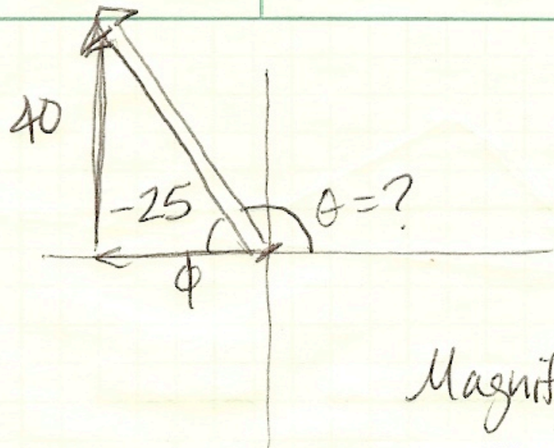
$\boxed{5.2\text{m} @ -60°}$

3.13



Resultant (measured) = $\boxed{350\text{ m @ } -3°}$

3.15



Magnitude of vector - solve using Pythagorean theorem

$c^2 = \sqrt{a^2+b^2}$

$c = \sqrt{(-25)^2+(40)^2} = \boxed{47.2m}$

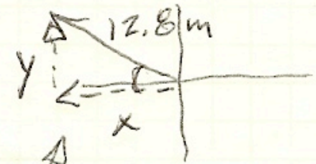
To get direction, solve for φ, then subtract from 180°.

$\tan \phi = \frac{opp}{adj} = \frac{40}{25} = 1.6$

$\theta = \tan^{-1}(1.6) = 58.0°$

$180 - 58 = \boxed{122°}$ So $\boxed{47.2m @ 122°}$

3.19 a. 12.8 m @ 150°



$x = -12.8 \cos 30 = -11.1\,m \Rightarrow$

or

$x = 12.8 \cos 150 = -11.1\,m$

$y = 12.8 \sin 30 = 6.4\,m$

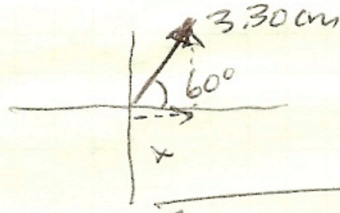
or

$y = 12.8 \sin 150 = 6.4\,m$

$\langle -11.1, 6.4 \rangle\,m$

$\boxed{(-11.1 i + 6.4 j)\,m}$

b. 3.30 cm @ 60°

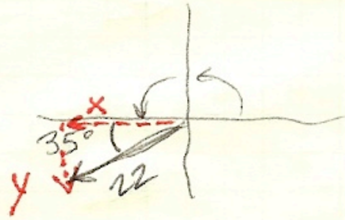


$x = 3.30 \cos 60$
$= 1.65$

$y = 3.30 \sin 60$
$= 2.86$

$\boxed{(1.65 i + 2.86 j)\,cm}$

c. 22.0 in @ 215°



$x = -22.0 \cos 35$
$= 22 \cos 215$
$= -18.0$

$y = -22 \sin 35$
$= 22 \sin 215$
$= -12.6$

$\boxed{(-18.0 i + -12.6 j)\,in.}$

3.23 $\vec{A} = 3i - 2j$ & $\vec{B} = -1i - 4j$

a) $\vec{A} + \vec{B} = (3i - 2j) + (-i - 4j)$

$= (3i - 1i) + (-2j - 4j)$

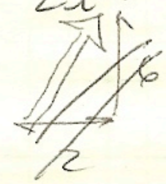
$= \boxed{2i + -6j}$

b) $\vec{A} - \vec{B} = (3i - 2j) - (-1i - 4j)$

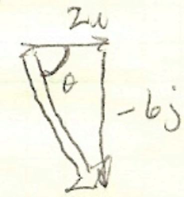
$= (3i + 1i) + (-2j + 4j)$

$= \boxed{4i + 2j}$

c) $|\vec{A} + \vec{B}|$ = the magnitude of $2i + -6j$



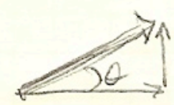
Use Pythagorean theorem:



$c = \sqrt{a^2 + b^2}$

$c = \sqrt{2^2 + 6^2} = \boxed{6.32}$

d) $|\vec{A} - \vec{B}|$ = magnitude of $4i + 2j$



$= \sqrt{4^2 + 2^2} = \boxed{4.47}$

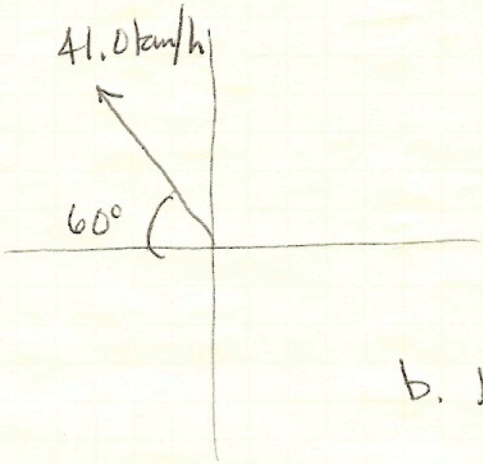
e) The directions of each:

$\theta_a = \tan^{-1}\frac{-6}{2} = \boxed{-71.6°}$

$= -\tan^{-1}\frac{6}{2}$

$\theta_b = \tan^{-1}\frac{2}{4} = \boxed{26.6°}$

3.41



a. Unit vector velocity of hurricane.

$x = {}^{-}41.0 \cos 60 = {}^{-}20.5$

$y = 41.0 \sin 60 = 35.5$

$\boxed{v = ({}^{-}20.5i + 35.5j)\ \text{km/h}}$

b. New velocity of hurricane traveling North is $\boxed{(\cancel{25.0i + 0j})\ \text{km/h}}$ $0i + 25j$

c. Displacement during first 3 hours

$x_1 = vt = ({}^{-}20.5i + 35.5j)(3)$

$= ({}^{-}61.5i + 107j)\ \text{km}$

d. During second 1.5 hrs

$x_2 = vt = (0i + 25j)(1.5) = (\cancel{37.5i + 0j})\ \text{km}$ $0i + 37.5j$

e. How far away (~~distance~~ displacement) after total 4.5 hrs?

Total displacement is $x_1 + x_2$

$\Delta x = (-61.5i + 107j) + (\cancel{25i + 0j})$ $0i + 37.5j$

$\Delta x = (-61.5i + 144j)$

$\text{displacement} = \sqrt{61.5^2 + 144^2}$

$= \boxed{157\ \text{km}}$