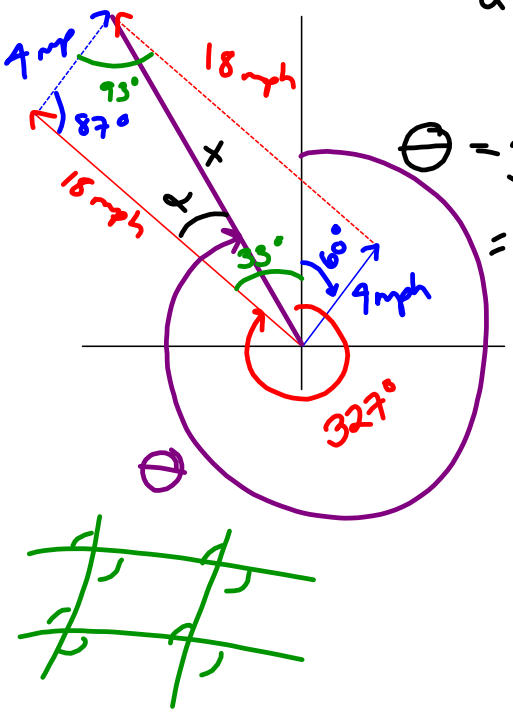
7.3 #40

boat heading 327° @ 18mph

current heading 60° @ 4 mph

course (angle heading) of boat?



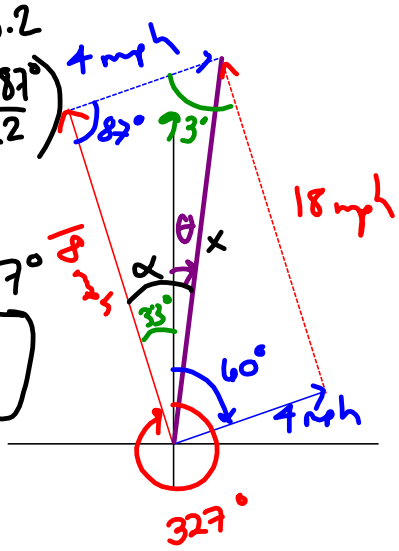
$\frac{\sin\alpha}{4} = \frac{\sin 87^\circ}{18.2}$

$\alpha = \sin^{-1}\left(\frac{4\sin 87^\circ}{18.2}\right)$

$= 12.7^\circ$

$\theta = 327^\circ + 12.7^\circ$

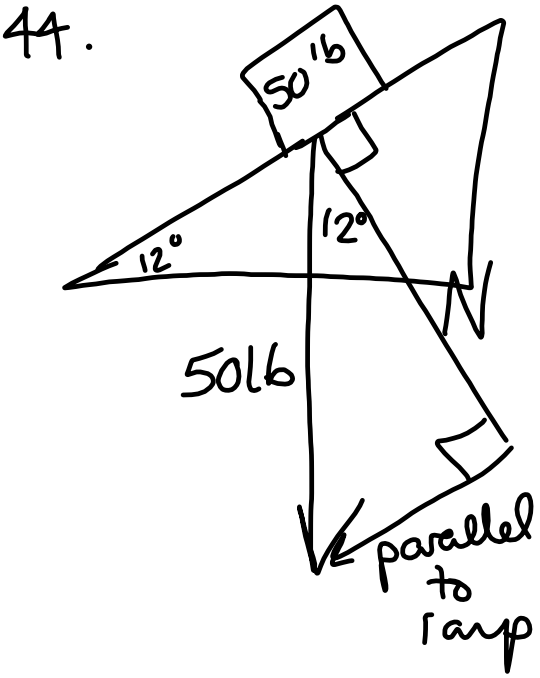
$= 339.7^\circ$



$x = \sqrt{4^2 + 18^2 - 2(4)(18)\cos 87^\circ}$

$= 18.2$

44.



Normal vector = perpendicular

$\cos 12^\circ = \frac{\text{magnitude of Normal}}{50\text{ lb}}$

$N = 50\cos 12^\circ$ lb

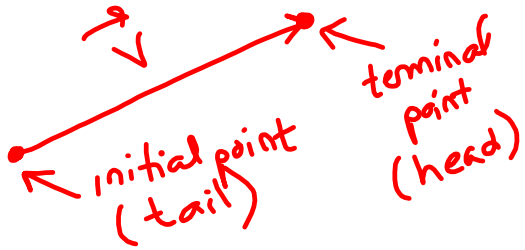
$\approx$

$\sin 12^\circ = \frac{\text{magnitude of parallel}}{50\text{ lb}}$

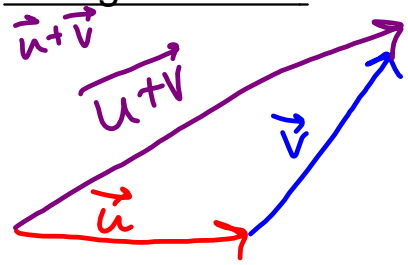
Vectors

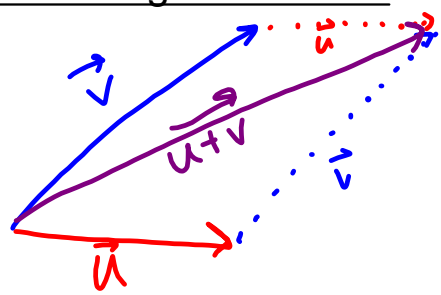
A vector is a directed line segment;
it has a unique length (magnitude) and direction angle

magnitude of $\vec{v} = |\vec{v}|$

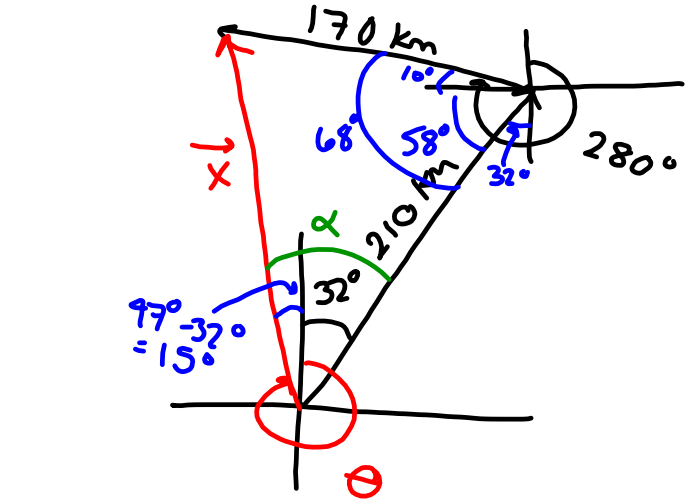


Vector Addition:
Vectors can be added using the
Triangle Method or the Parallelogram Method





7.5 #28. An airplane flies 032° (heading) for 210 km, and then 280° for 170 km. How far is the plane then, from the starting point, and in what direction?



$x = \sqrt{170^2 + 210^2 - 2(170)(210)\cos 68}$

$= 215$ km

$\frac{\sin\alpha}{170} = \frac{\sin 68°}{215}$

$\alpha = \sin^{-1}\left(\frac{170\sin 68°}{215}\right)$

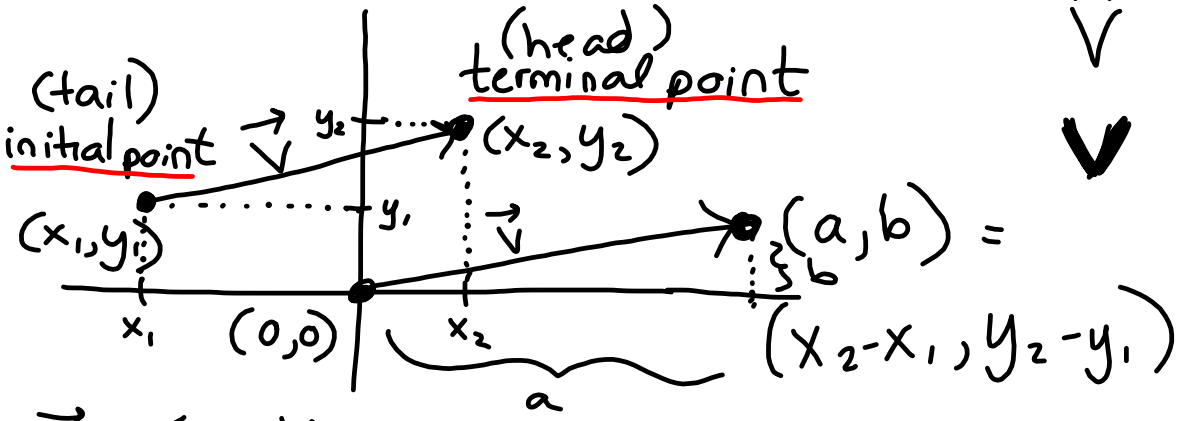
$= 47°$

$\theta = 360° - 15°$

$= 345°$

Vectors!

$\vec{v}$ $\hat{v}$ **v**



$\vec{v} = \langle a, b \rangle$ = "component form" of the vector whose initial point is $(0,0)$ and terminal point is (a,b).

$\overrightarrow{CD}$, $C(2,5)$, $D(3,-1)$

initial pt terminal pt

find a vector $\vec{v}$ equivalent to $\overrightarrow{CD}$ whose initial point is $(0,0)$.

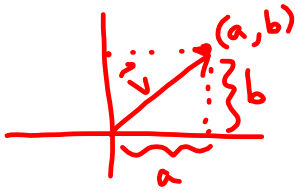
terminal point − initial point

$(3-2, -1-5) = (1, -6)$

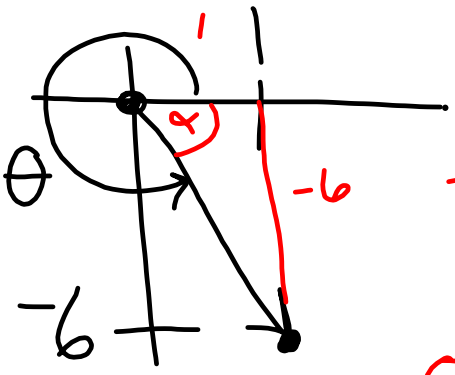
$\vec{v} = \langle 1, -6 \rangle$

magnitude of $\vec{v} = \langle a, b \rangle$

$|\vec{v}| = \sqrt{a^2+b^2}$



direction $\angle\theta$ is measured counter-clockwise from $0°$.



$\vec{w} = \langle 1, -6 \rangle$

$\tan\alpha = \left|\frac{-6}{1}\right|$

$\alpha = \tan^{-1}\left|\frac{b}{a}\right|$

$\theta = 360° - \alpha$

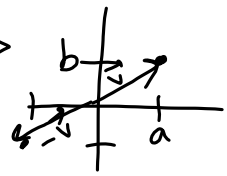
$\tan\alpha = \left|\frac{b}{a}\right|$

$\alpha = \tan^{-1}\left|\frac{b}{a}\right|$

Vector Operations

$\vec{v} = \langle a, b \rangle$; $\vec{w} = \langle c, d \rangle$; $k \in \mathbb{R}$

1. $|\vec{v}| = \sqrt{a^2+b^2}$
2. $k\vec{v} = k\langle a, b \rangle = \langle ka, kb \rangle$
   "scalar multiplication"
3. $\vec{v} + \vec{w} = \langle a+c, b+d \rangle$
4. $-\vec{v} = \langle -a, -b \rangle$
5. $\vec{v} - \vec{w} = \langle a-c, b-d \rangle$
6. $\vec{0} = \langle 0, 0 \rangle$ "zero vector"



$\vec{v} = \langle 12, -5 \rangle$; $\vec{w} = \langle 2, 7 \rangle$

a. $|\vec{v}| = \sqrt{12^2 + (-5)^2} = 13$

b. $\vec{v} + \vec{w} = \langle 12+2, -5+7 \rangle = \langle 14, 2 \rangle$

c. $-5\vec{v} = -5\langle 12, -5 \rangle = \langle -60, 25 \rangle$

d. $3\vec{v} - 4\vec{w} = \langle 3(12) - 4(2), 3(-5) - 4(7) \rangle$

$= \langle 36 - 8, -15 - 28 \rangle$

$= \langle 28, -43 \rangle$

Homework #9 (due Fri. 10/17):

- 7.1 #1-21 odd — solving triangles with Law of Sines
- 7.1 #29,30,33,34,35 — word problems with Law of Sines
- 7.2 #9-19 odd — solving triangles with Law of Cosines
- 7.2 #25-29odd; — area
- 7.2 #38,43,46,47,48 — word problems with Law of Cosines
- 7.3 #37,41,43 — word problems with Law of Sines/Cosines

Homework #10 (due Fri. 10/24)

- 7.3 #1-35 odd — vector operations
- 7.3 #45-59 odd — dot product and angle between vectors
- 7.4 #1-65 odd — trigonometric form of complex numbers

Quiz #7 - Friday 10/17 Law of Sines/Cosines

Test #4 - ~~next week?~~ Wed, 10/22