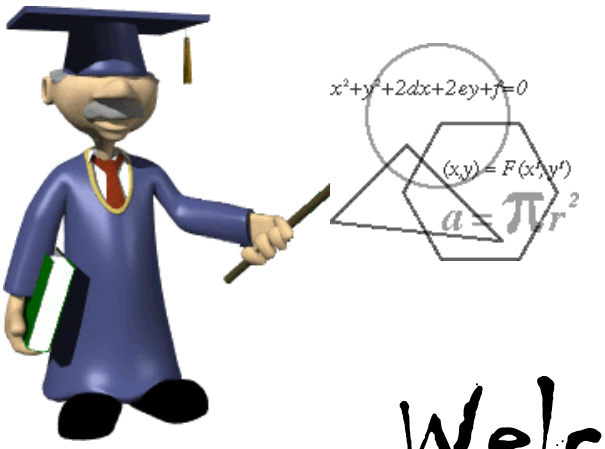
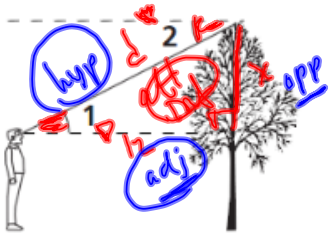
L9.4



Welcome Back!

Use the diagram for Exercises 1 and 2.



1. Describe how ∠1 relates to the situation. ∠ elev fm person to tree

2. Describe how ∠2 relates to the situation. ∠ dep fm tree to man

A 6-ft man stands 12 ft from the base of a tree. The angle of elevation from his eyes to the top of the tree is 76°.

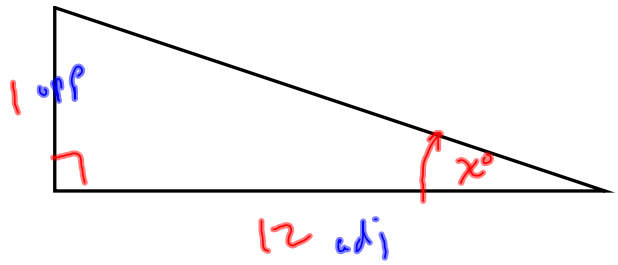
3. About how tall is the tree? (Rnd to nearest ft) tan 76° = x/12 54 ft

4. If the man releases a pigeon that flies directly to the top of the tree, about how far will it fly? (nearest ft) cos 76° = 12/d 50 ft
   from his eye

5. What is the angle of depression from the treetop to the man's eyes? 76° ≅ alt int ∠s

P485 #20

slope $\leq \frac{1 \text{ rise}}{12 \text{ run}}$

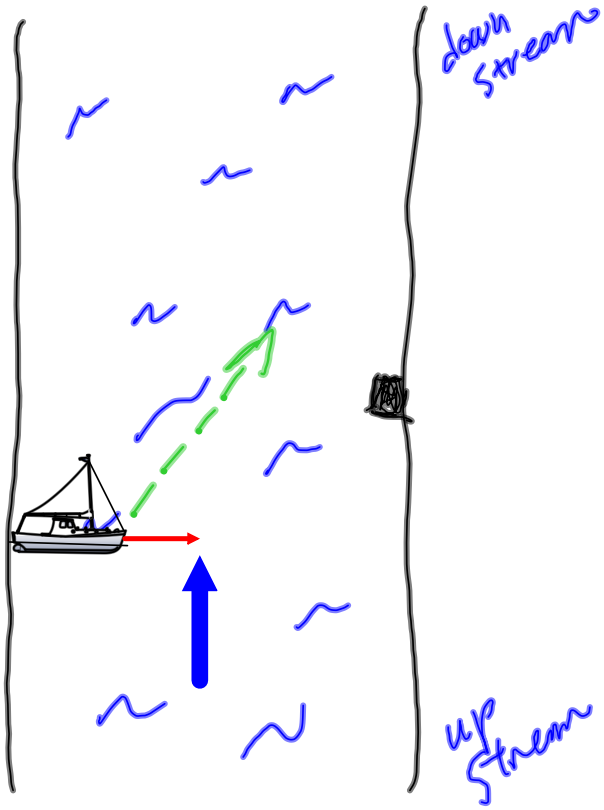


$\tan x^\circ = \frac{1}{12}$

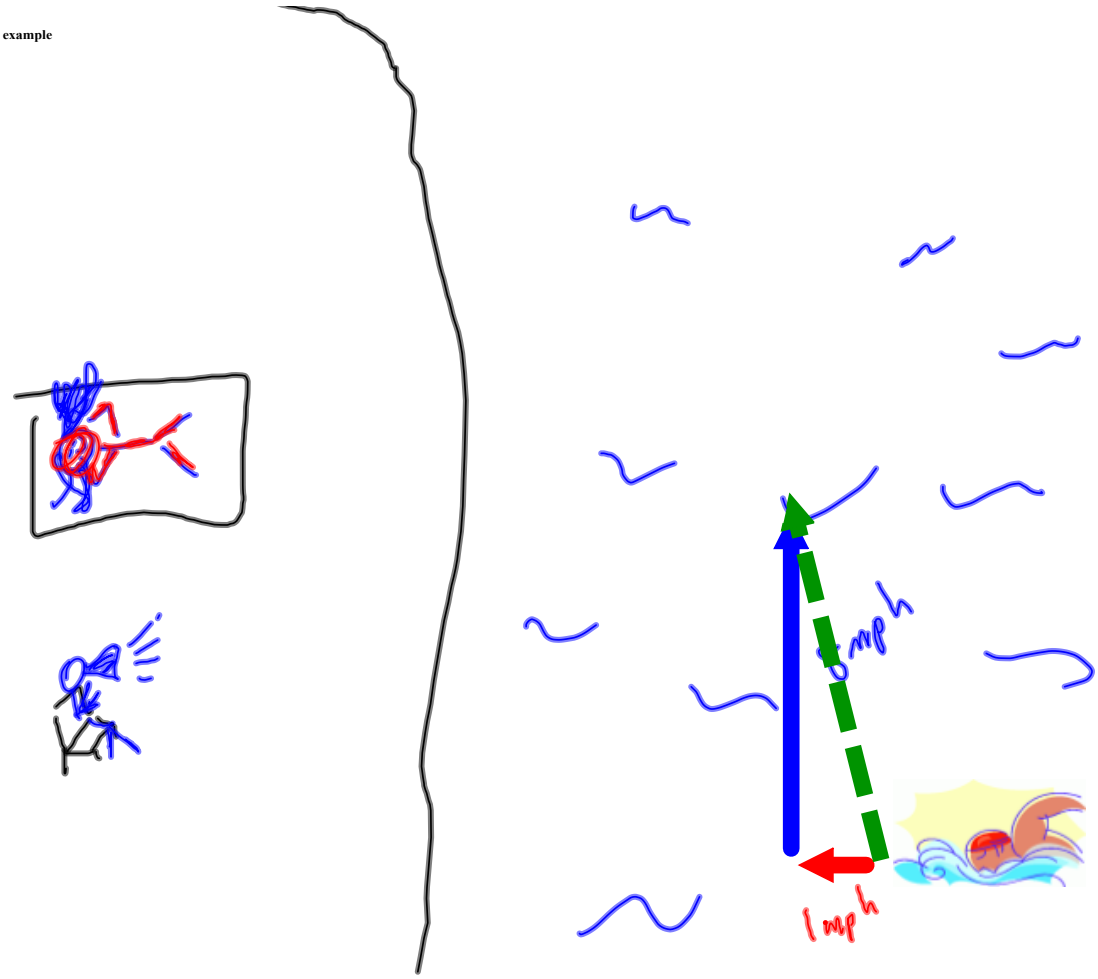
$x^\circ = \tan^{-1} \frac{1}{12}$

$= 4.8^\circ$

river example



rip tide example



Defn: Vector L9.4

A quantity with direction and magnitude (distance, speed, etc).

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* Represented by an arrow *

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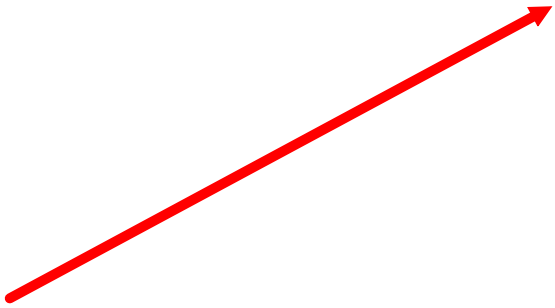
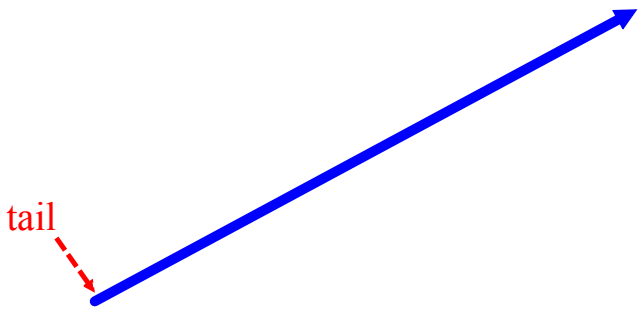


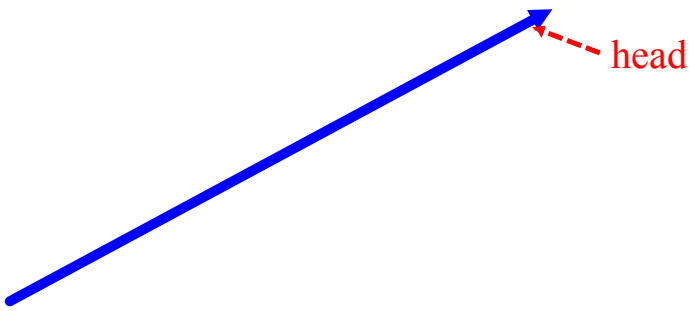
Defn: Tail of vector L9.4

Initial / starting point of the vector.



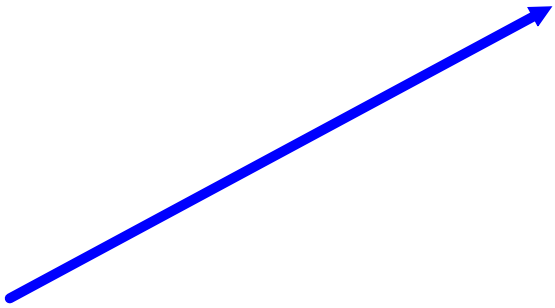
Defn: Head of vector L9.4

End / terminal point of the vector.



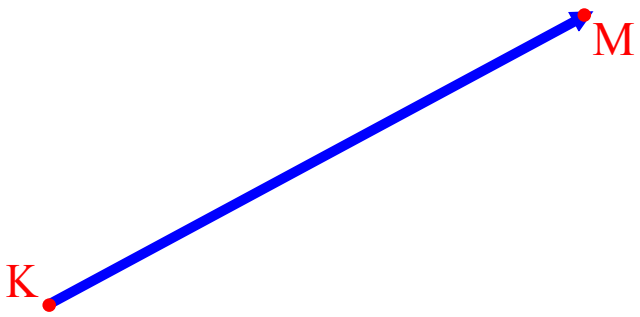
Vector labeling L9.4

If tail is at pt K and head is at pt M:



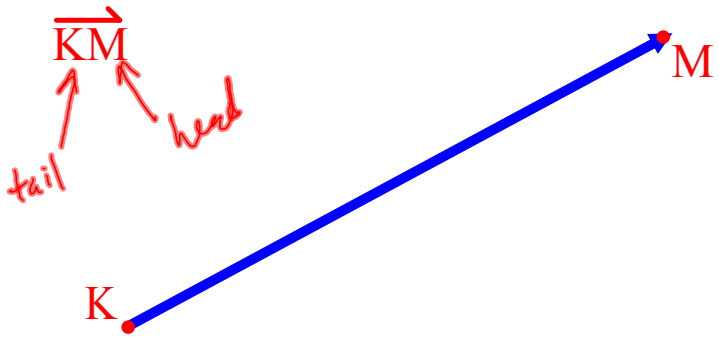
Vector labeling L9.4

If tail is at pt K and head is at pt M:



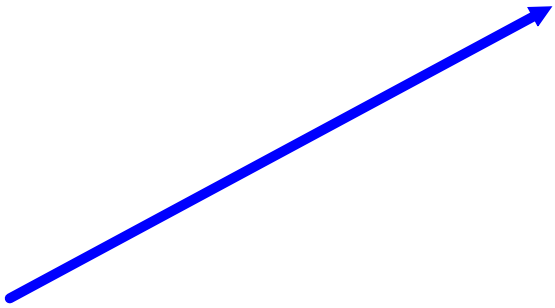
Vector labeling L9.4

If tail is at pt K and head is at pt M:



Vector labeling L9.4

... or it can be labeled with a lower case letter:



Vector labeling L9.4

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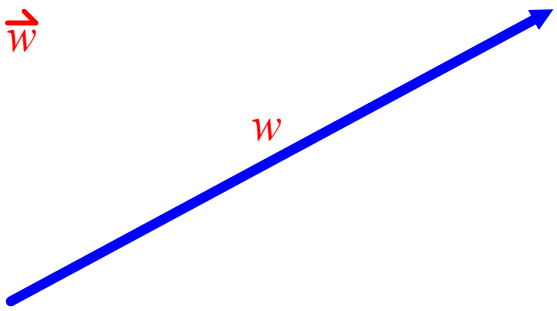


The vector symbol $\longrightarrow$ L9.4

Don't confuse it with the symbol for a ray...

The vector symbol $\longrightarrow$ L9.4

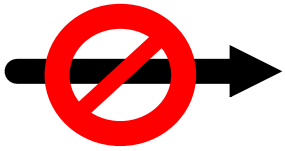
Don't confuse it with the symbol for a ray...

...the vector symbol only has a single barb going up.

The vector symbol $\vec{\ }$ L9.4

Don't confuse it with the symbol for a ray...

...the vector symbol only has a single barb going up.



NO!

YES!

Describing vectors L9.4

Two ways:

Describing vectors L9.4

Two ways:

1) Ordered pairs (x, y) in the coordinate plane.

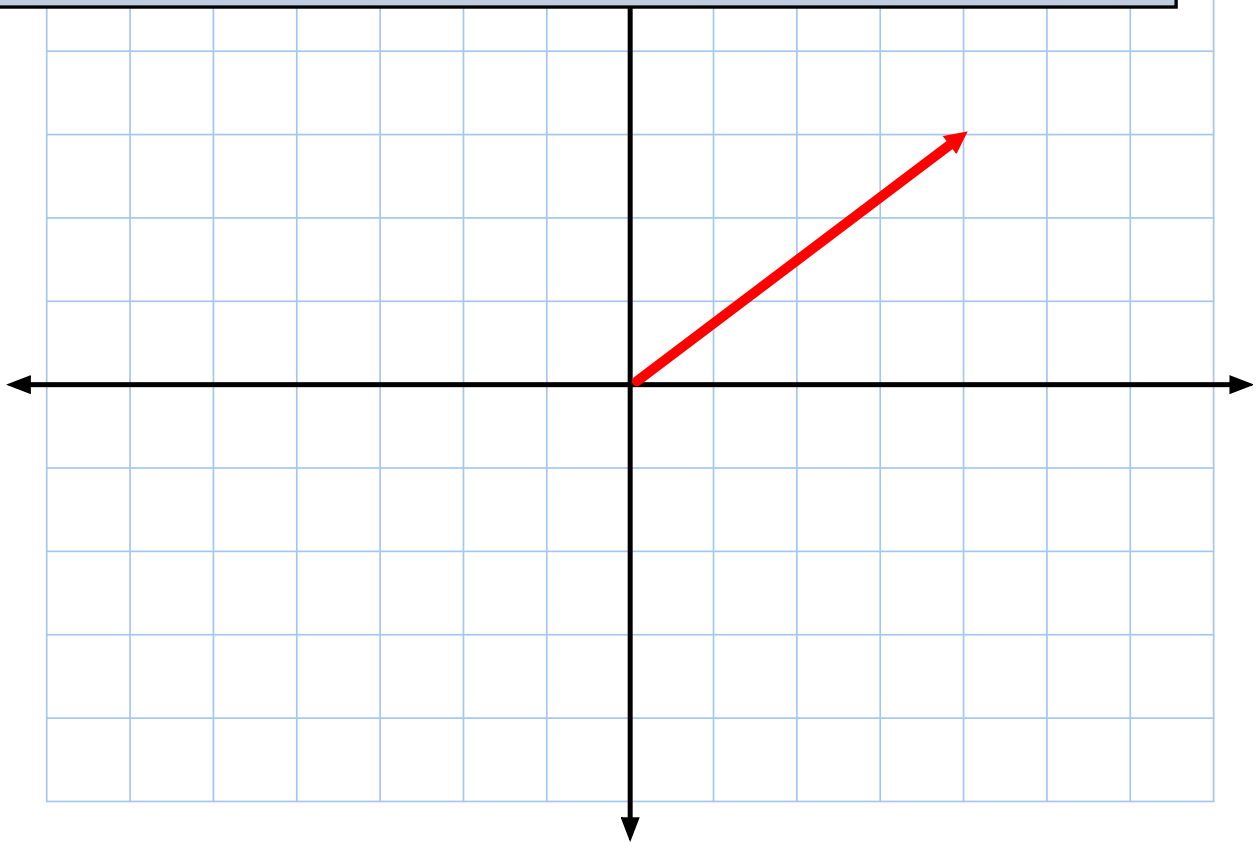
Describing vectors L9.4

Two ways:

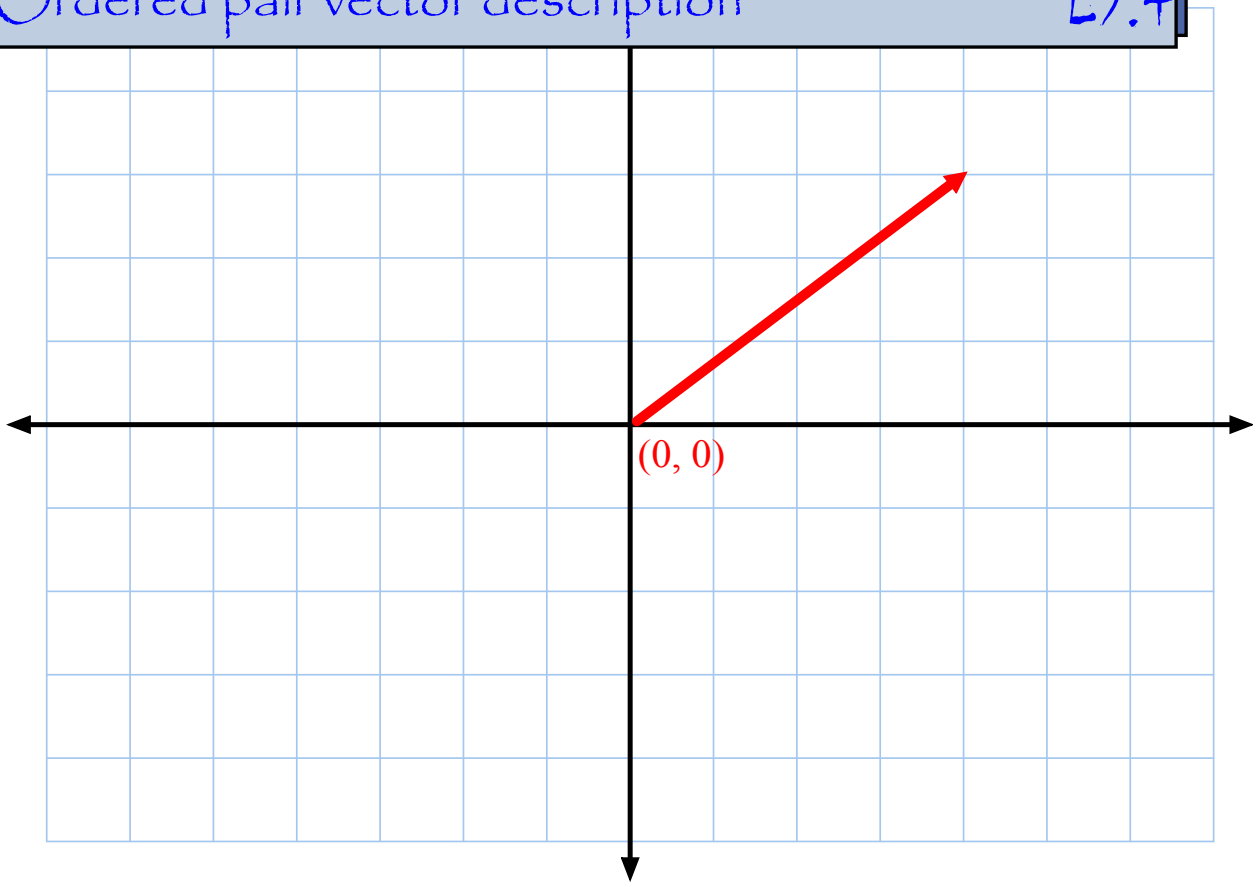
1) Ordered pairs (x, y) in the coordinate plane.

2) Compass directions.

Ordered pair vector description L9.4

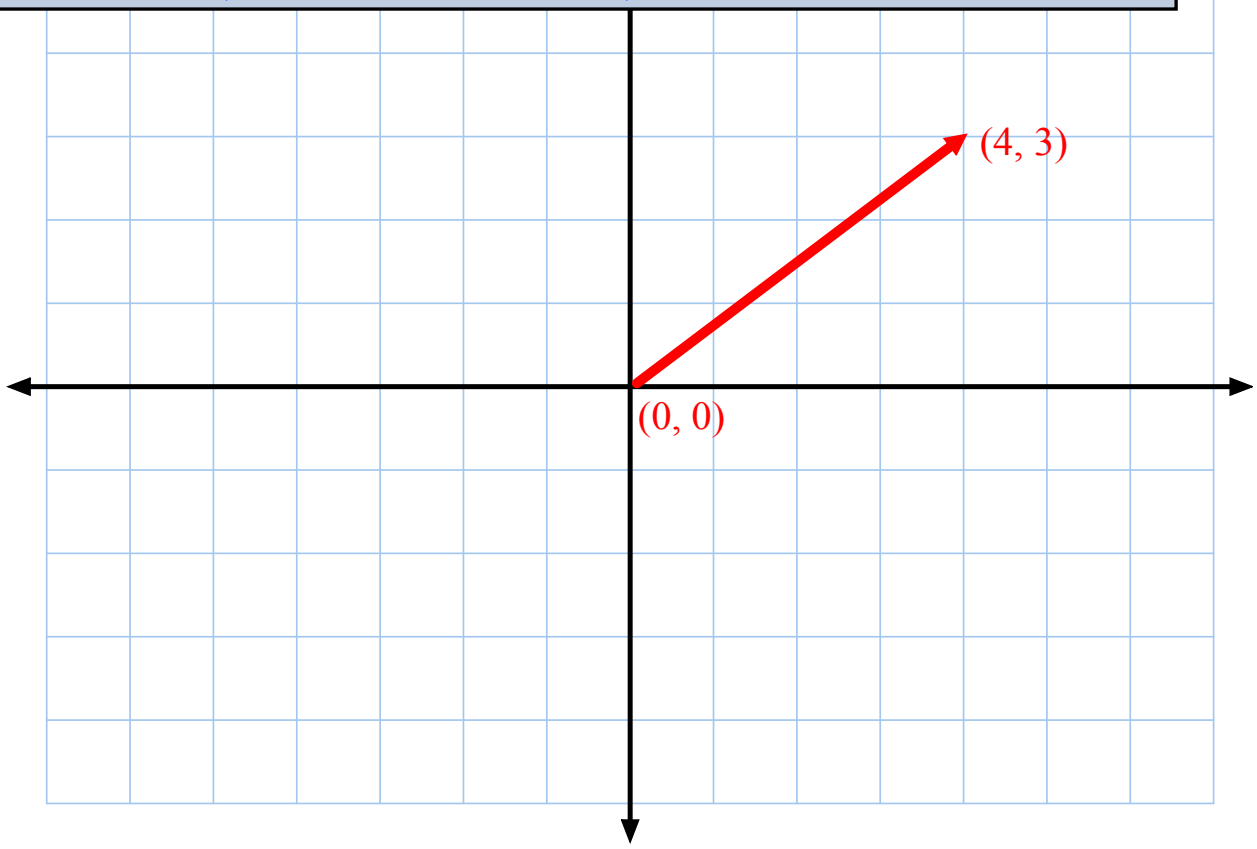


Ordered pair vector description L9.4



Ordered pair vector description

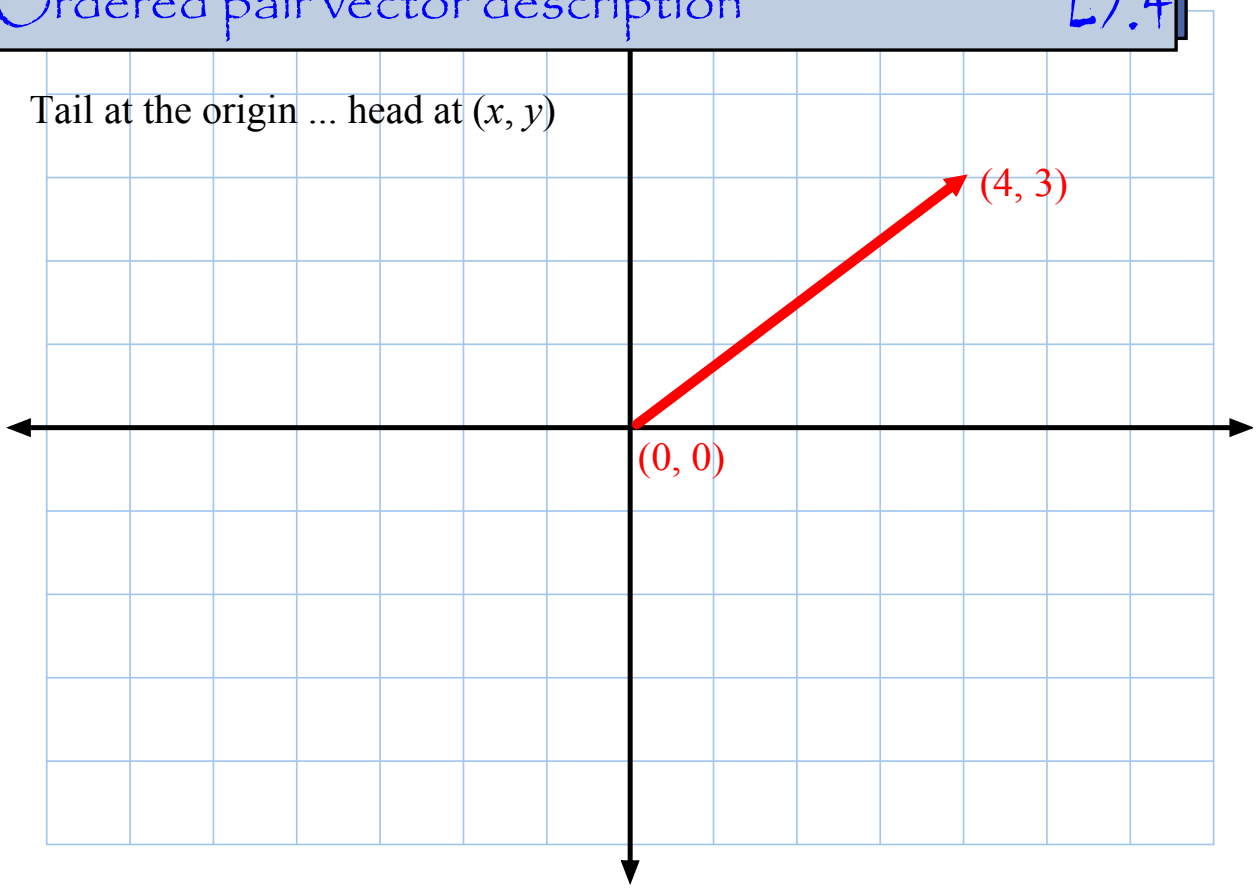
L9.4



Ordered pair vector description

L9.4

Tail at the origin ... head at (x, y)

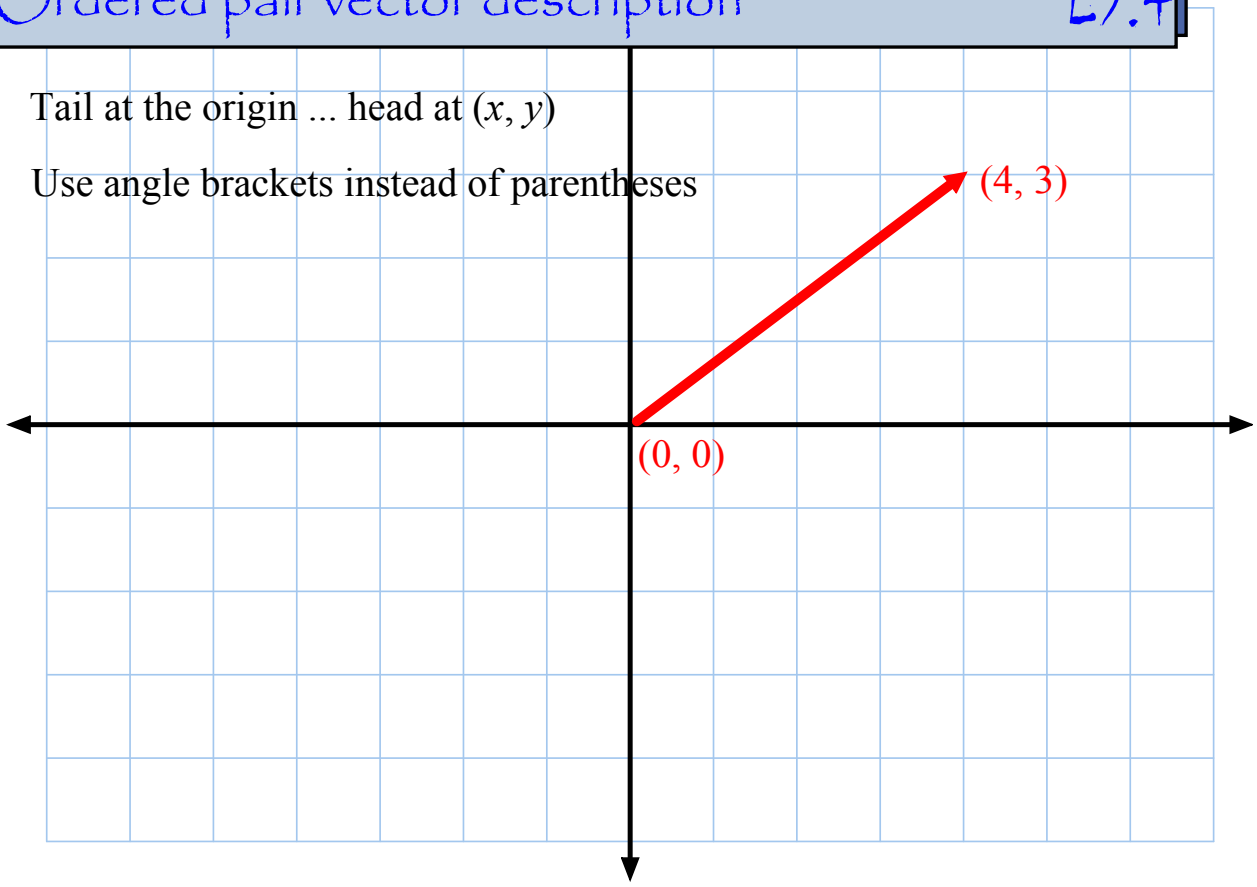


Ordered pair vector description

L9.4

Tail at the origin ... head at (x, y)

Use angle brackets instead of parentheses



Ordered pair vector description

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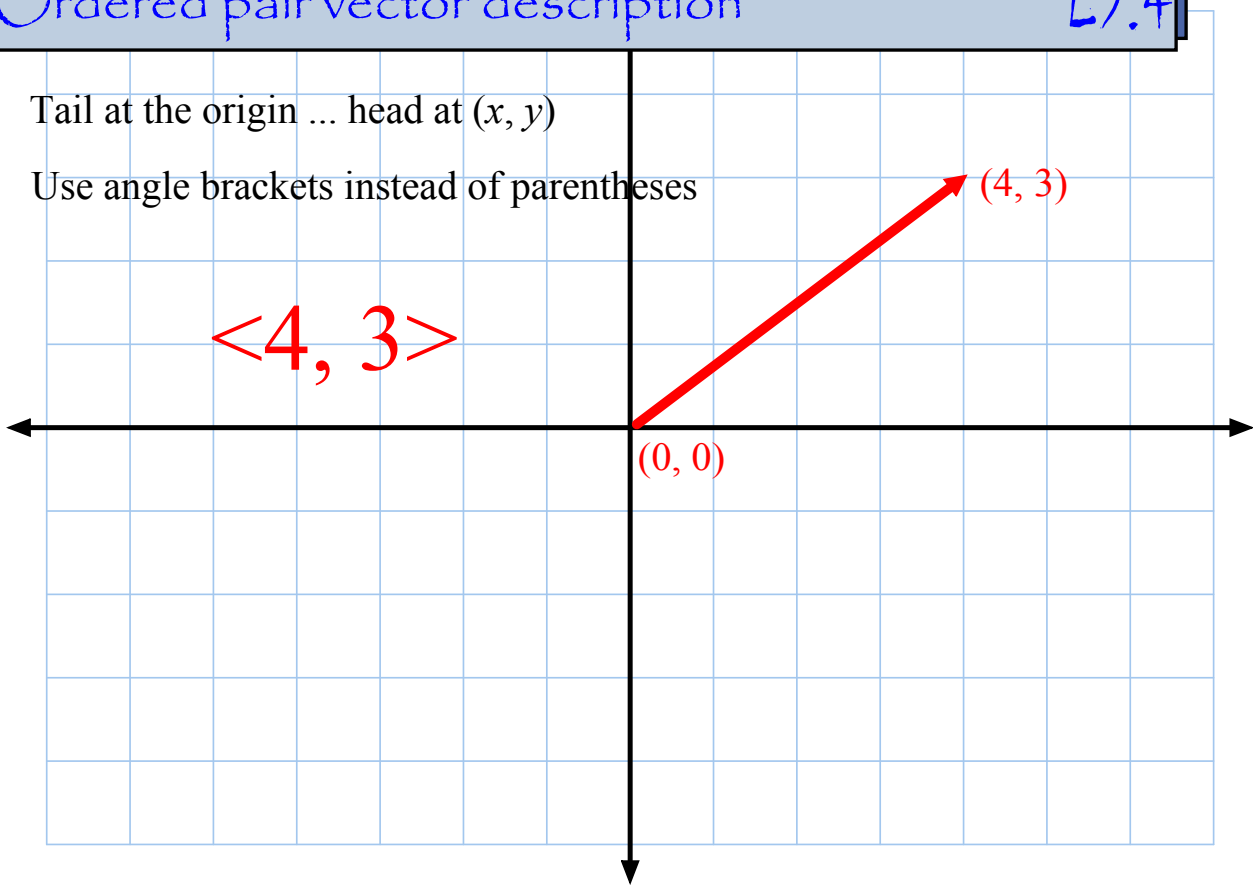
Tail at the origin ... head at (x, y)

Use angle brackets instead of parentheses



Ordered pair vector description

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Tail at the origin ... head at (x, y)

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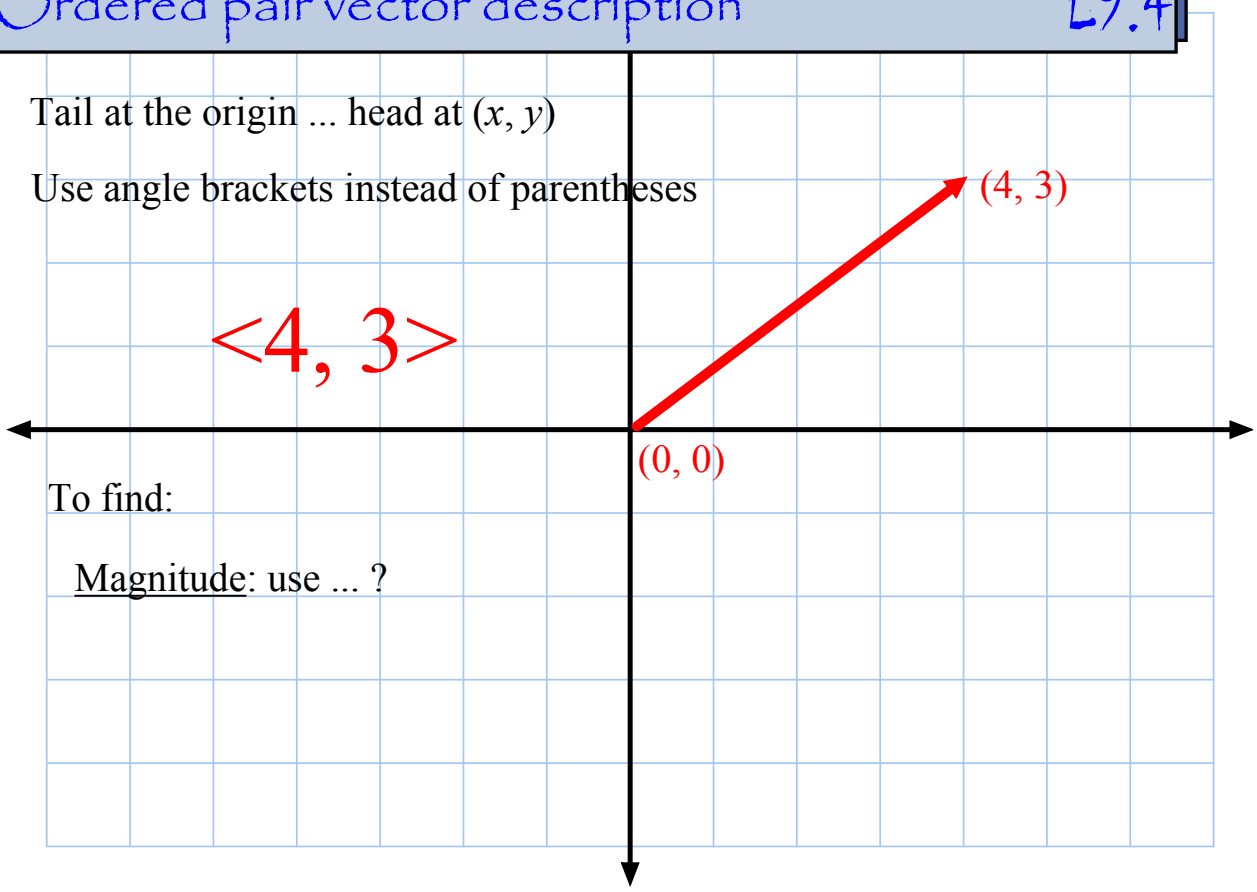


To find:

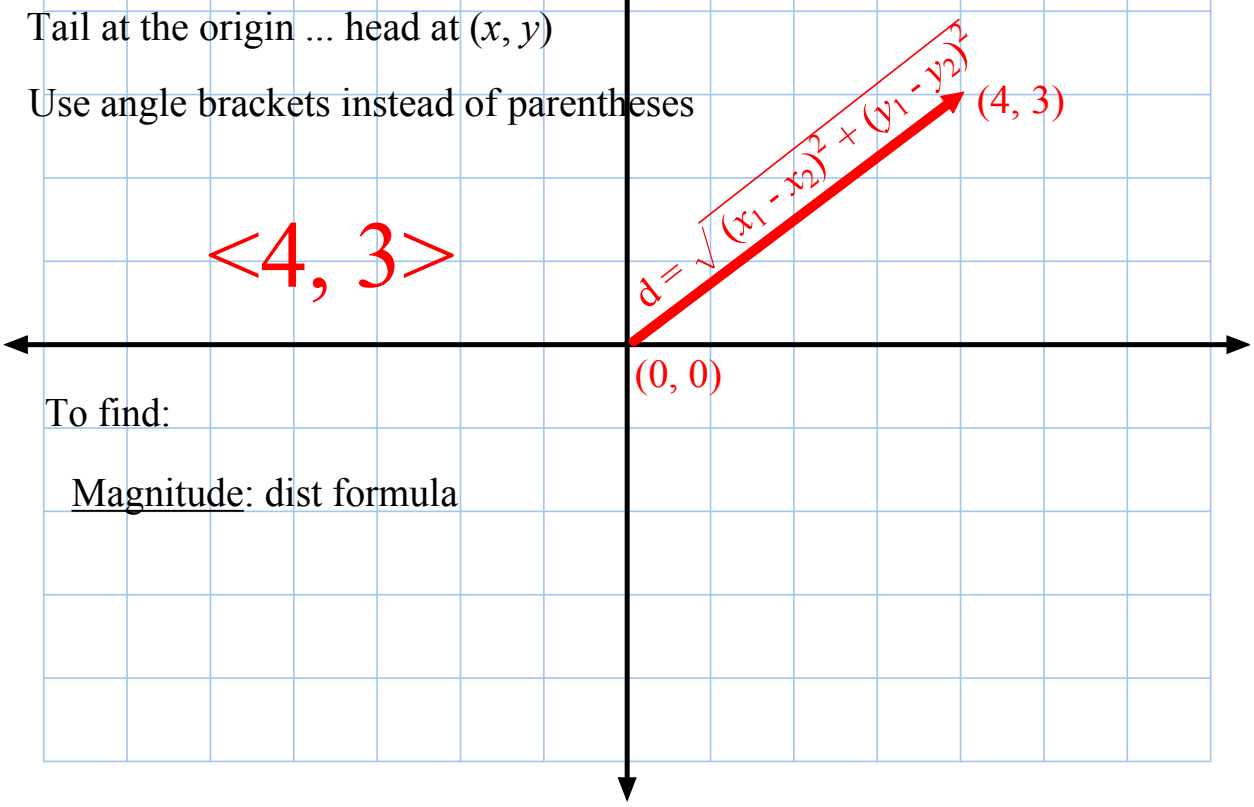
Magnitude: use ... ?

Ordered pair vector description

L9.4

Tail at the origin ... head at (x, y)

Use angle brackets instead of parentheses



To find:

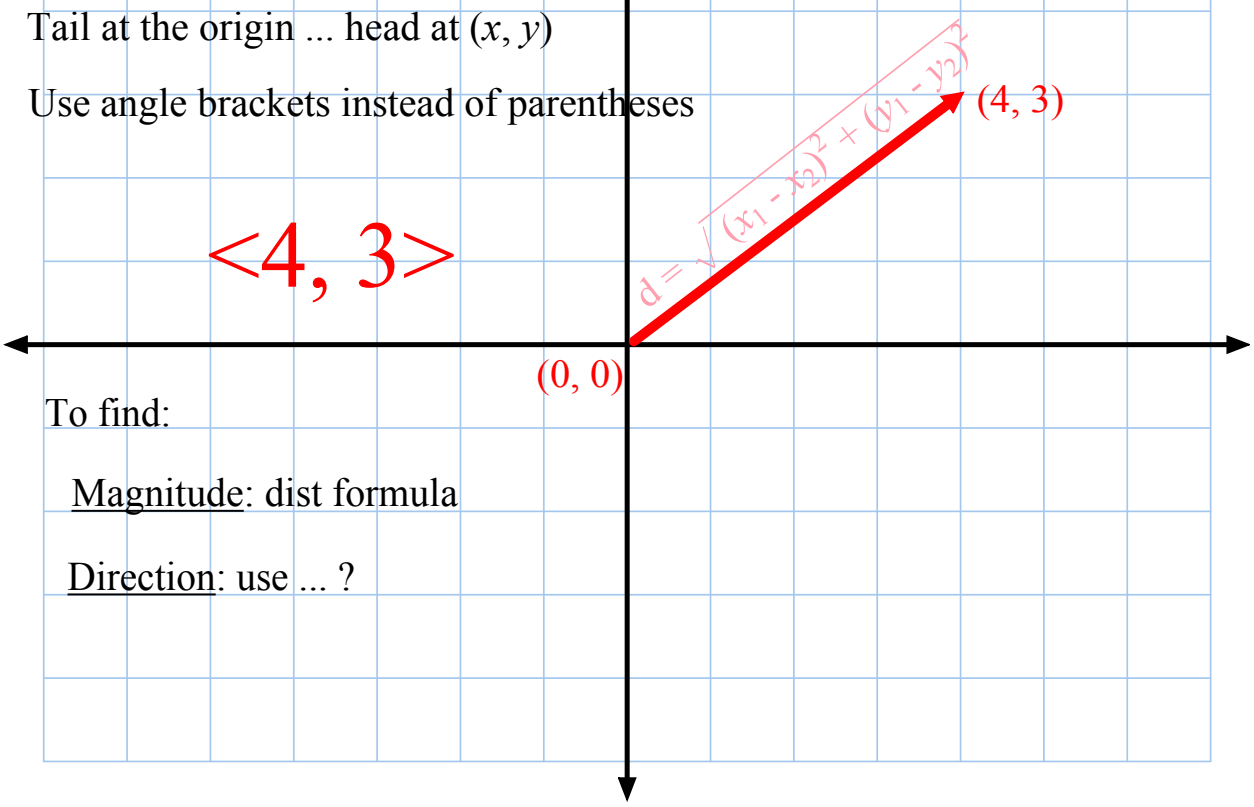
Magnitude: dist formula

Ordered pair vector description

L9.4

Tail at the origin ... head at (x, y)

Use angle brackets instead of parentheses



To find:

Magnitude: dist formula

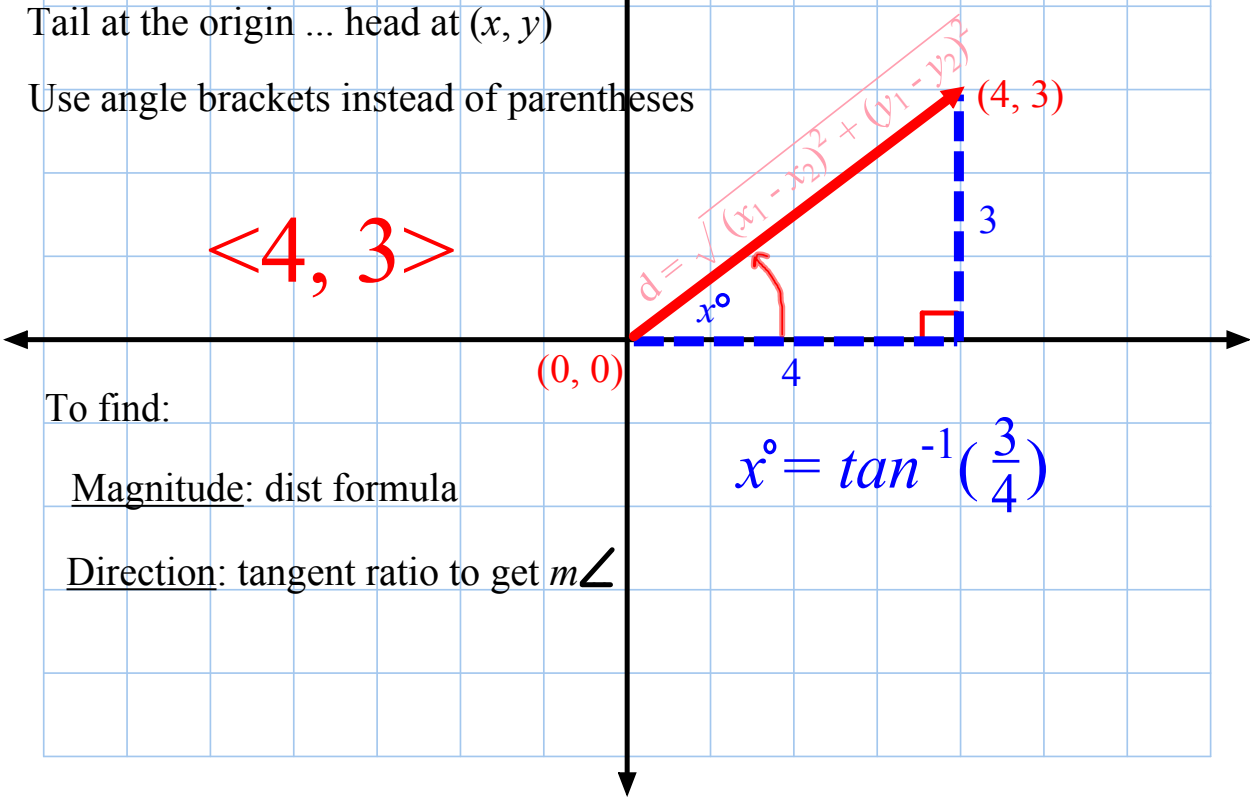
Direction: use ... ?

Ordered pair vector description

L9.4

Tail at the origin ... head at (x, y)

Use angle brackets instead of parentheses



$\langle 4, 3 \rangle$

To find:

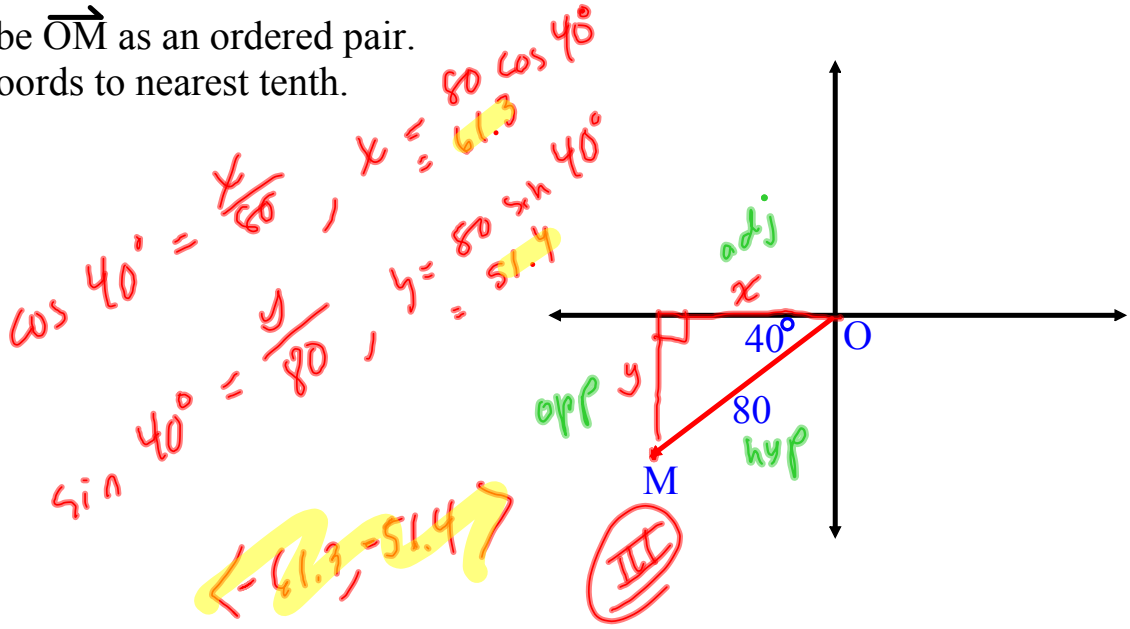
Magnitude: dist formula

Direction: tangent ratio to get $m\angle$

$$x^\circ = \tan^{-1}\left(\frac{3}{4}\right)$$

Example: Ordered pair vector description L9.4

Describe $\overrightarrow{OM}$ as an ordered pair.
Give coords to nearest tenth.



Practice: Ordered pair vector description L9.4

Pg 493, #1-3

① $\langle 602.2, 668.8 \rangle$

$x = 900 \cos 48°$

$y = 900 \sin 48°$

② $\langle -307.3, -54.2 \rangle$

$x = 312 \cos 10°$ (neg)

$y = 312 \sin 10°$ (neg)

③ $\langle 37.5, -65.0 \rangle$

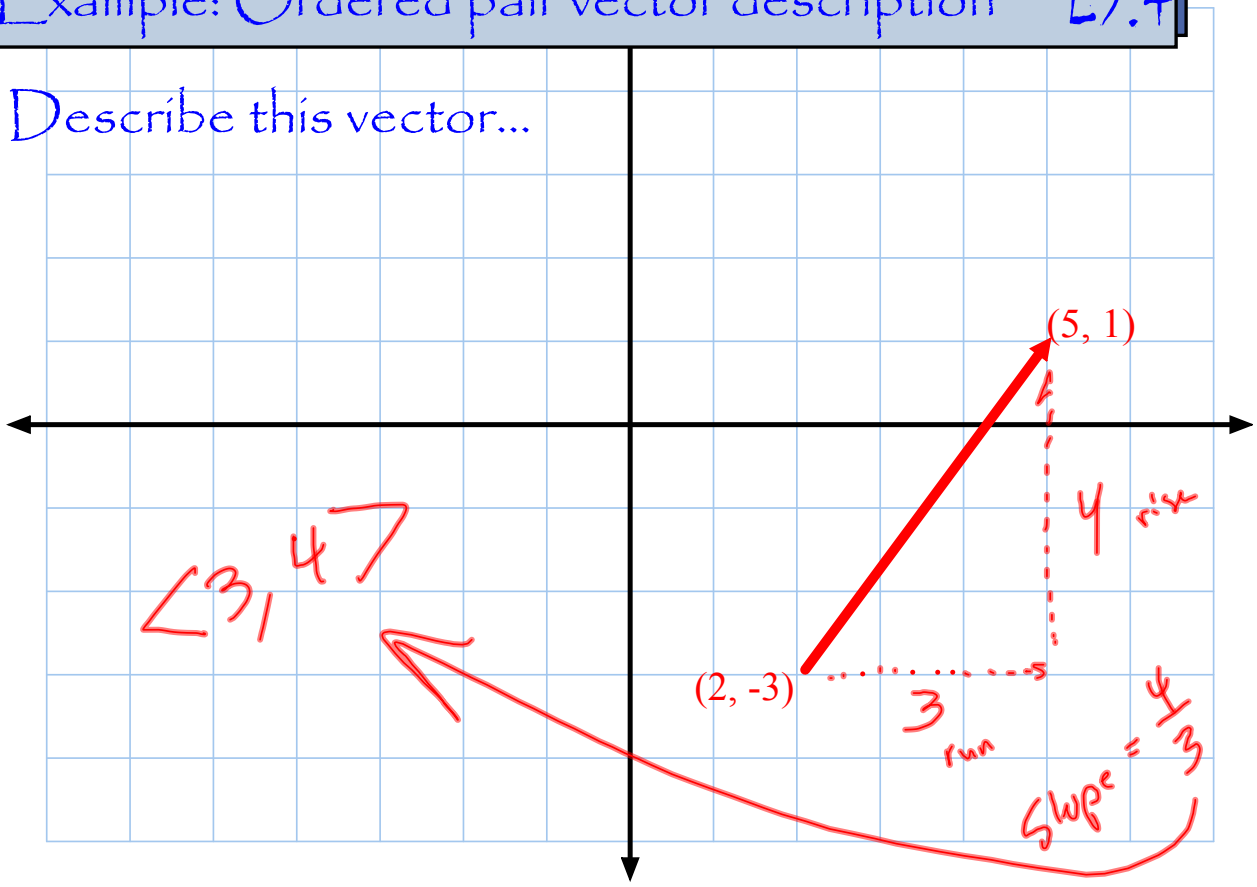
$x = 75 \sin 30°$

$y = 75 \cos 30°$ (neg)

* Make sure to use angle brackets! Wrong on test if use parens!

Example: Ordered pair vector description L9.4

Describe this vector...



Describing vectors... L9.4

What was the 1st way to describe vectors?

Describing vectors... L9.4

1) Ordered pair <*x*, y> in coord plane.

Describing vectors... L9.4

1) Ordered pair <*x*, y> in coord plane.

2) ...what was the 2nd way?

Describing vectors... L9.4

1) Ordered pair <*x*, y> in coord plane.

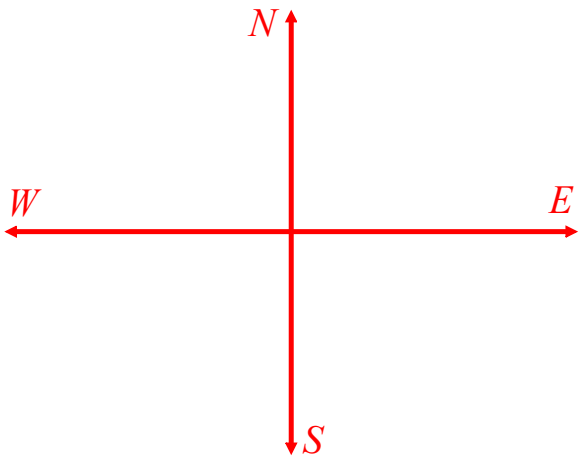
2) Compass direction.

Compass direction vector description L9.4

Compass rose:

Compass direction vector description L9.4

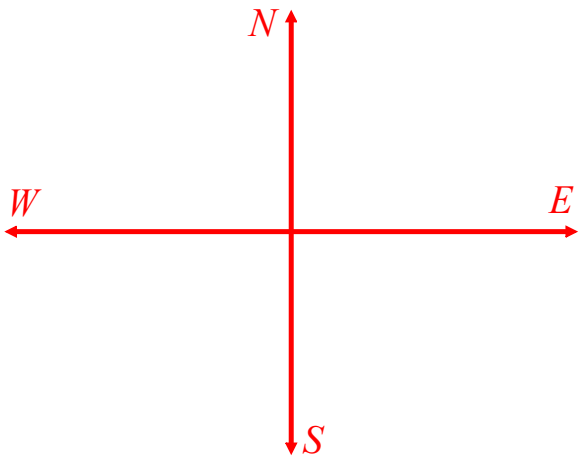
Compass rose:



Compass direction vector description L9.4

Compass rose:

y-axis:

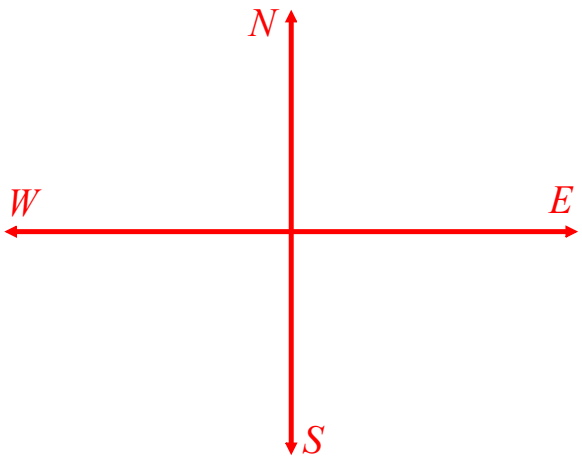


Compass direction vector description L9.4

Compass rose:

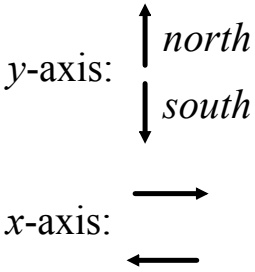
y-axis: ↑ *north*

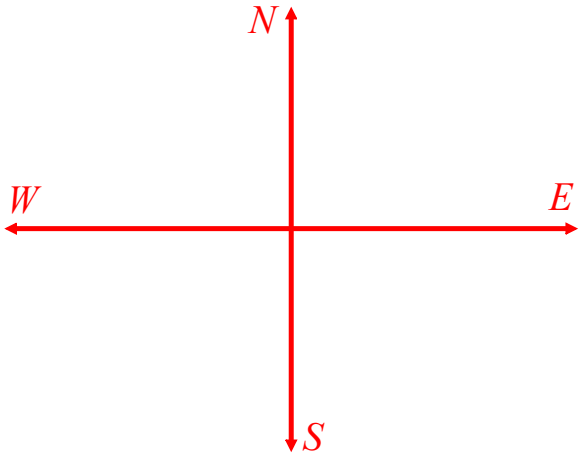
↓ *south*



Compass direction vector description L9.4

Compass rose:



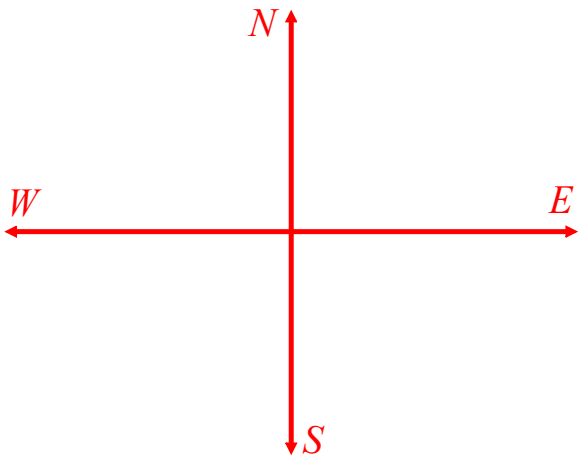


Compass direction vector description L9.4

Compass rose:

y-axis: ↑ *north*, ↓ *south*

x-axis: → *east*, ← *west*

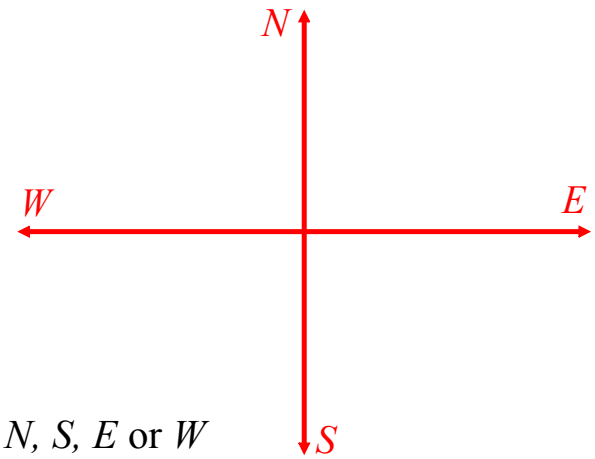


Compass direction vector description L9.4

Compass rose:

y-axis: *north*, *south*

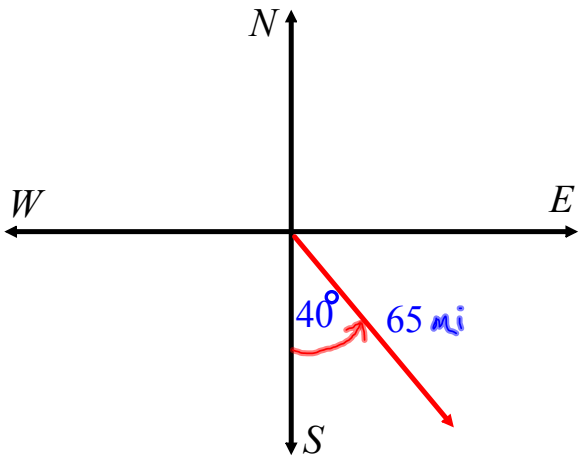
x-axis: *east*, *west*



Give directions as degrees relative to *N, S, E* or *W*

Example: Compass direction vector descrip L9.4

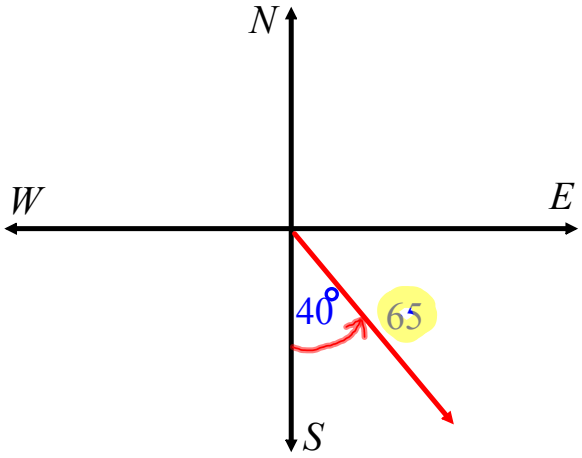
This vector is 65 *mi* 40° *E* of *S*



Example: Compass direction vector descrip L9.4

This vector is 65 *mi* 40° *E* of *S*

magnitude



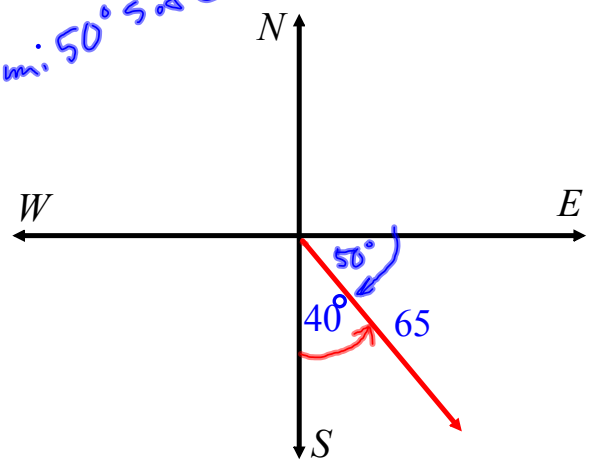
Example: Compass direction vector descrip L9.4

This vector is 65 *mi* 40°*E* of *S*

magnitude

direction

or 65 mi. 50° S of E



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This vector is 65 *mi* 40° *E* of *S*

magnitude

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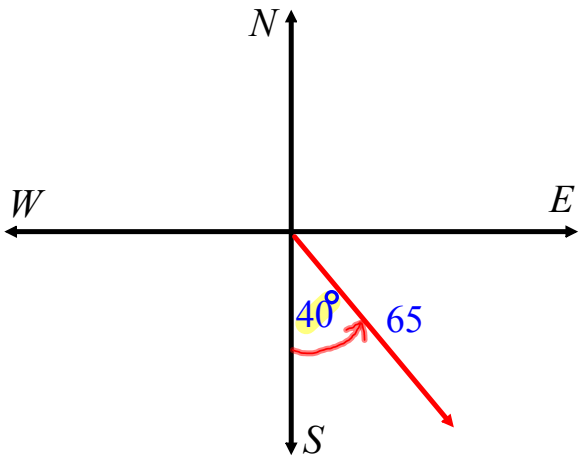


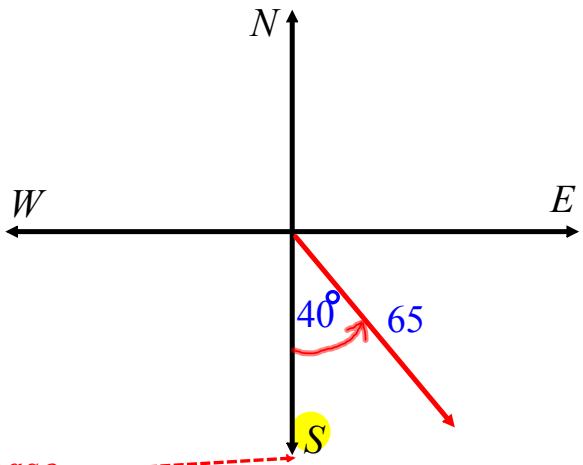
Example: Compass direction vector descrip L9.4

This vector is 65 *mi* 40°*E* of *S*

magnitude

direction

from the base

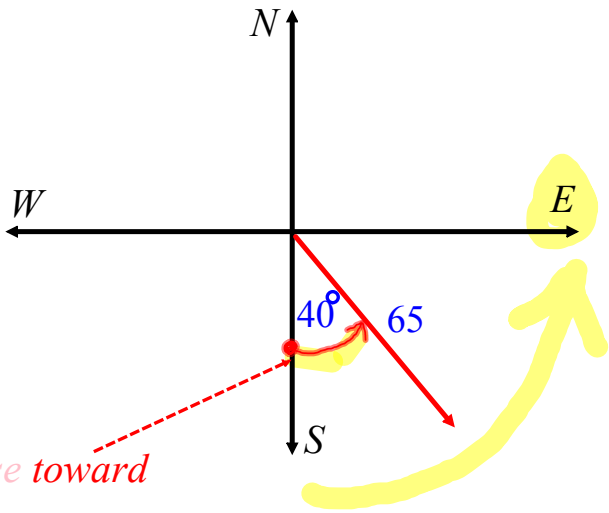


Example: Compass direction vector descrip L9.4

This vector is 65 *mi* 40° *E of S*

magnitude

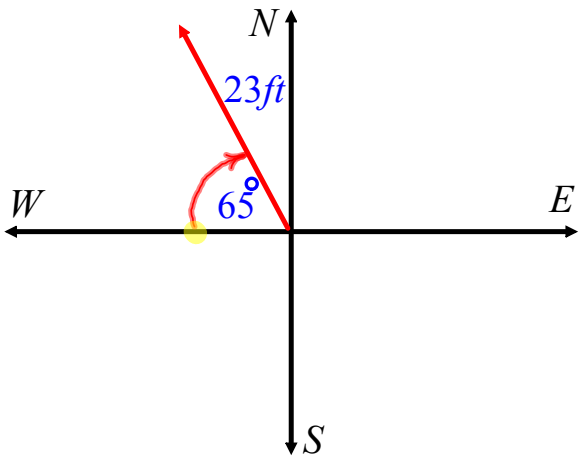
direction



from the base toward

Example: Compass direction vector descrip L9.4

Describe this vector:



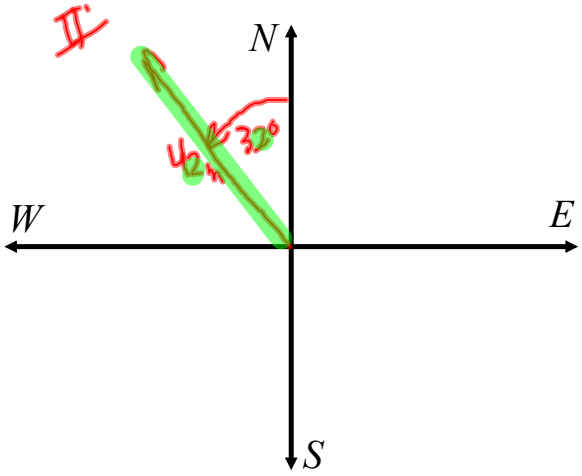
23 ft 65° N of W

Example: Compass direction vector descrip L9.4

Sketch the vector $42m$ 32° W of N

Which quad round? II

II



Example: Compass direction vector descrip L9.4

A boat sailed 12 *mi* east and 9 *mi* south.
The trip can be described by the vector <12, -9>.
Use distance and direction (compass direction) to describe it a 2nd way.

nearest mile & degree.

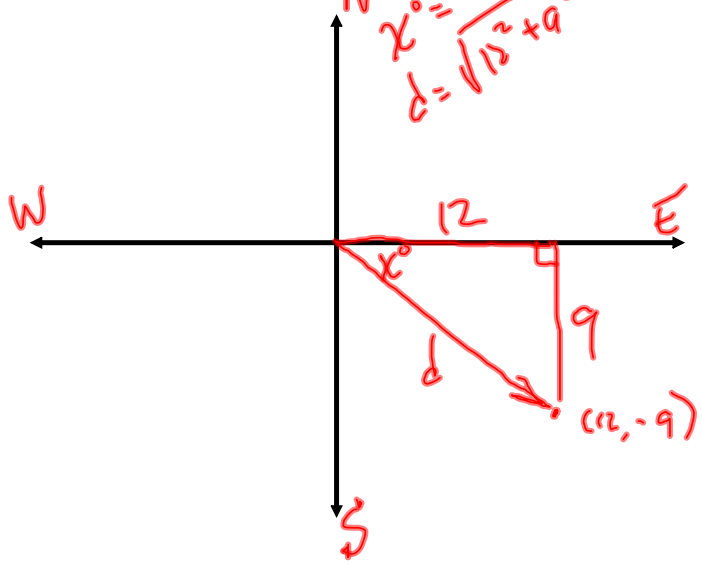
$x° = \tan^{-1}\frac{9}{12} \approx 37°$

$d = \sqrt{12^2 + 9^2} = 15$

15 mi 37° S of E

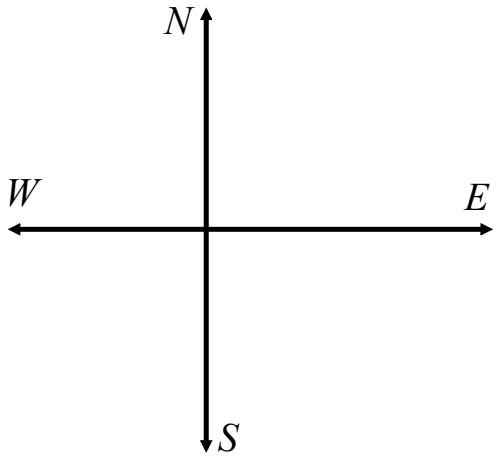
or

15 mi 53° E of S



Adding vectors L9.4

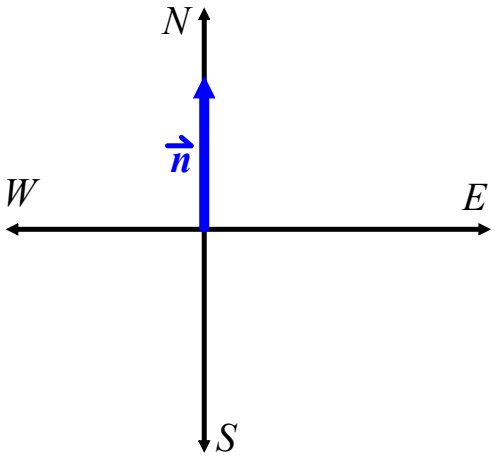
The directions "go 3 *mi* north then 4 *mi* east" can be represented by 2 vectors:



Adding vectors L9.4

The directions "go 3 *mi* north then 4 *mi* east" can be represented by 2 vectors:

1) a vector $\vec{n}$ pointing due north, magnitude 3

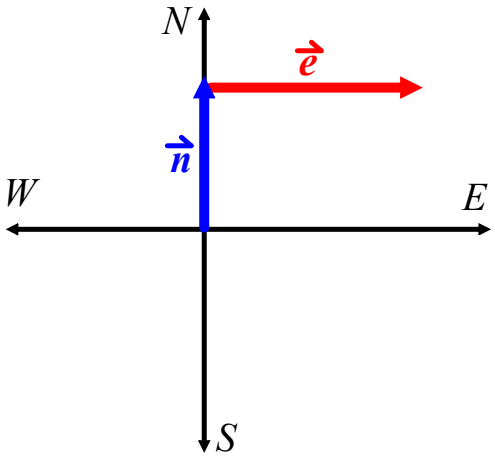


Adding vectors L9.4

The directions "go 3 *mi* north then 4 *mi* east" can be represented by 2 vectors:

1) a vector $\vec{n}$ pointing due north, magnitude 3

2) a vector $\vec{e}$ pointing due east, magnitude 4



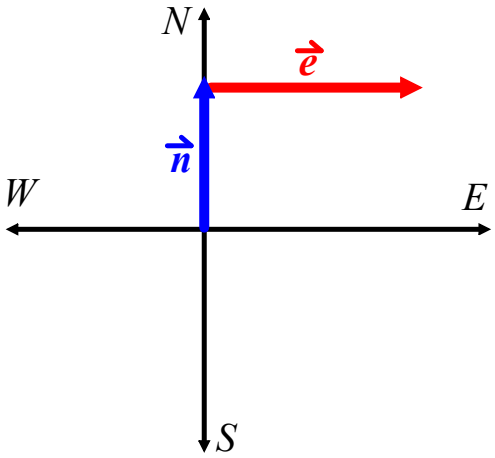
Adding vectors L9.4

The directions "go 3 *mi* north then 4 *mi* east" can be represented by 2 vectors:

1) a vector $\vec{n}$ pointing due north, magnitude 3

2) a vector $\vec{e}$ pointing due east, magnitude 4

If these were directions, wouldn't it be easier to just go straight there?



Adding vectors L9.4

The directions "go 3 *mi* north then 4 *mi* east" can be represented by 2 vectors:

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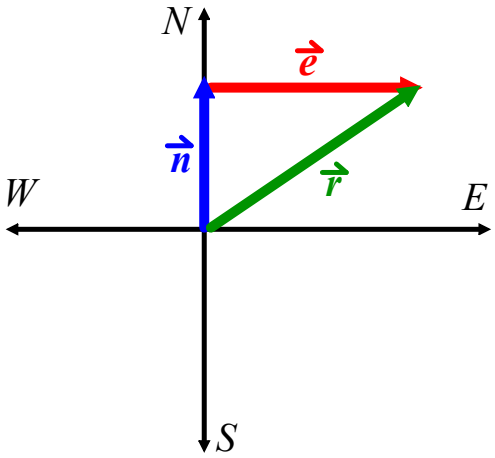

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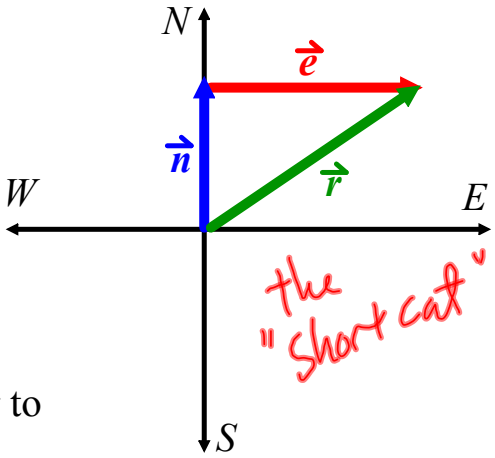

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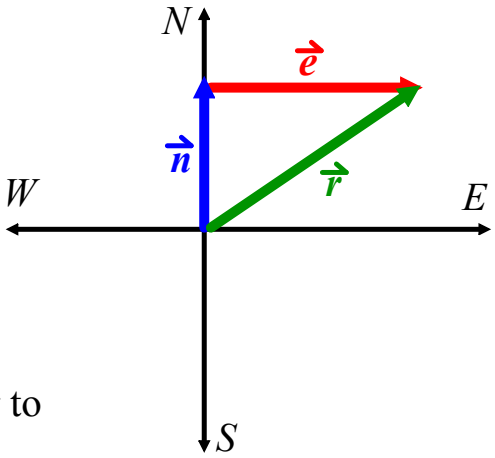

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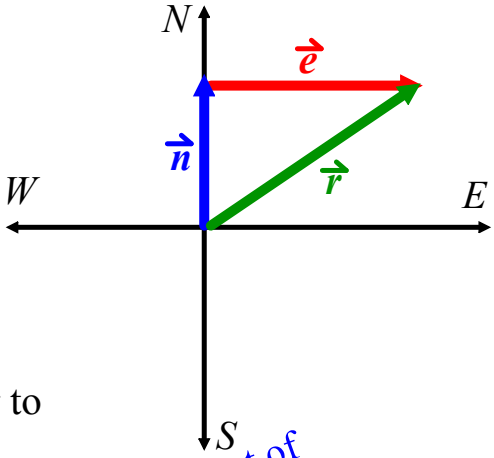

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$\vec{n} + \vec{e} = \vec{r}$ **resultant**

...basically the net effect of the two vectors combined.

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Visually, adding the vectors is placing them *tail-to-head*:

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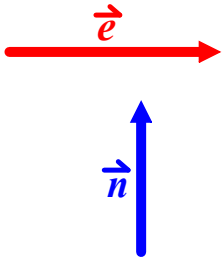

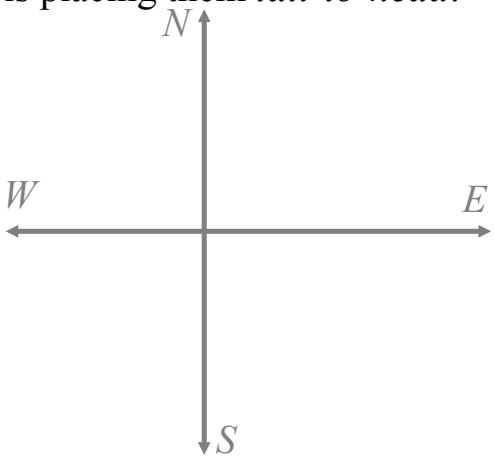

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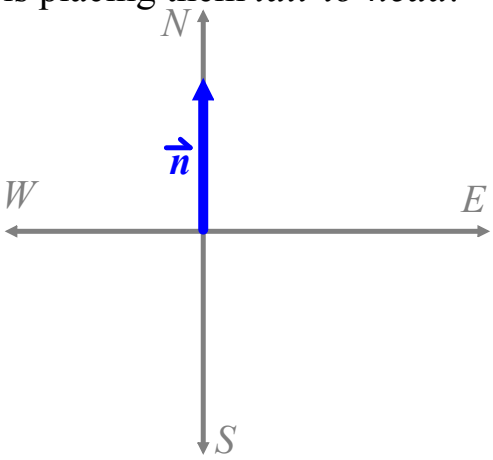

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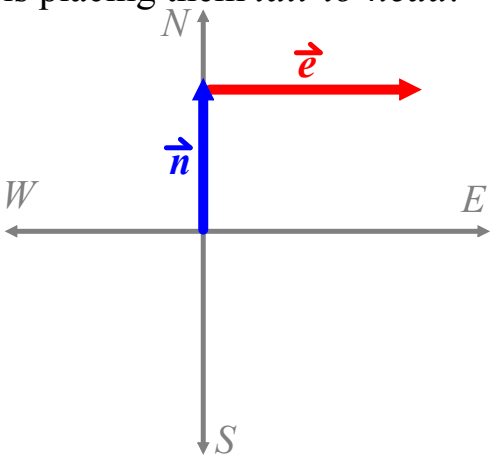

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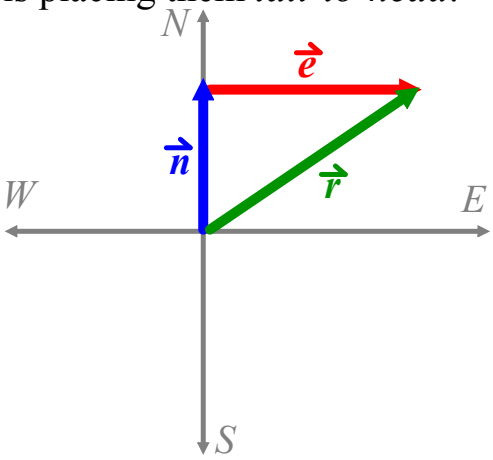

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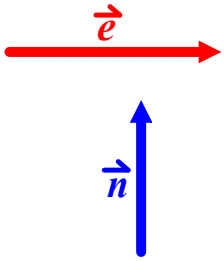

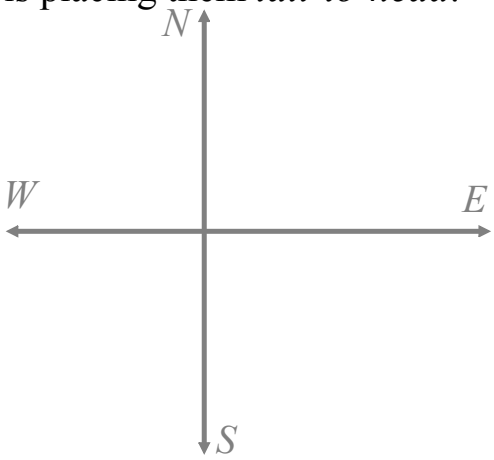

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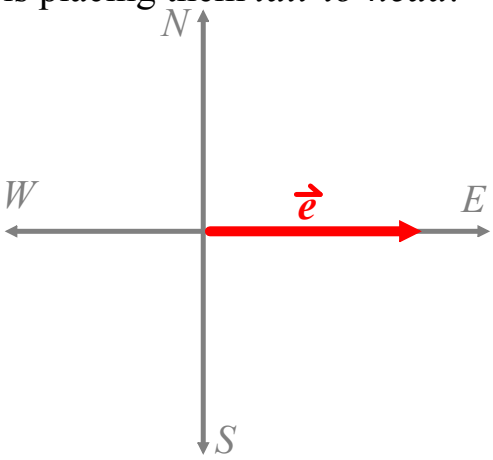

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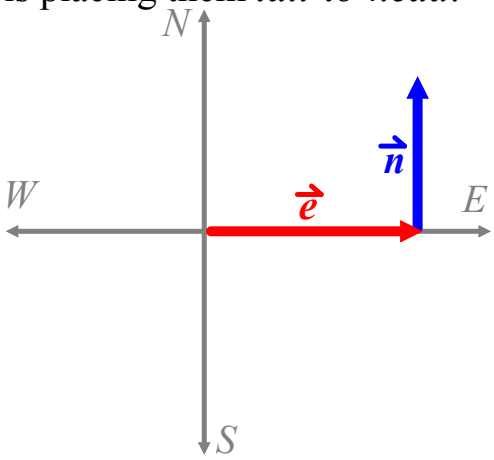

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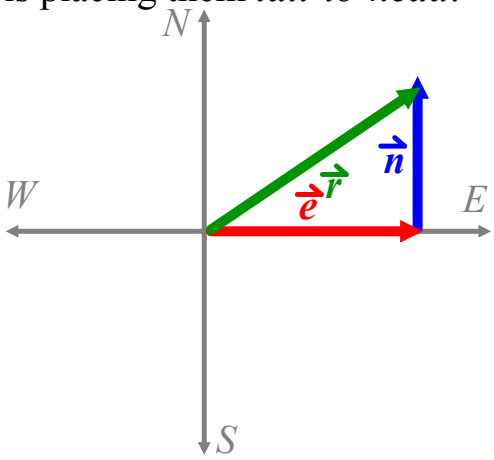

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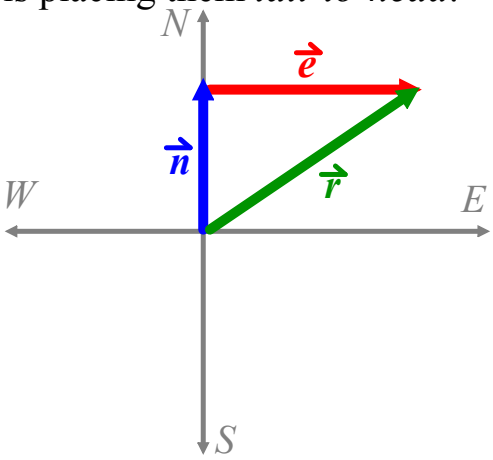

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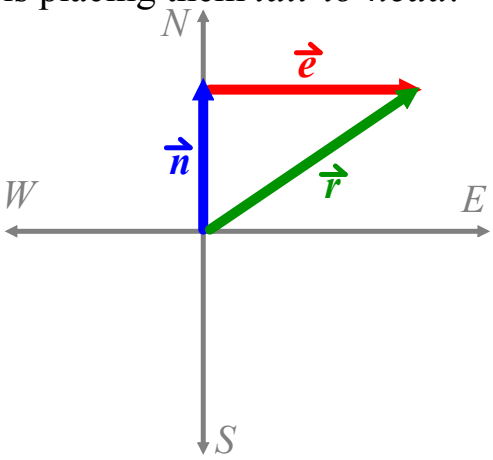

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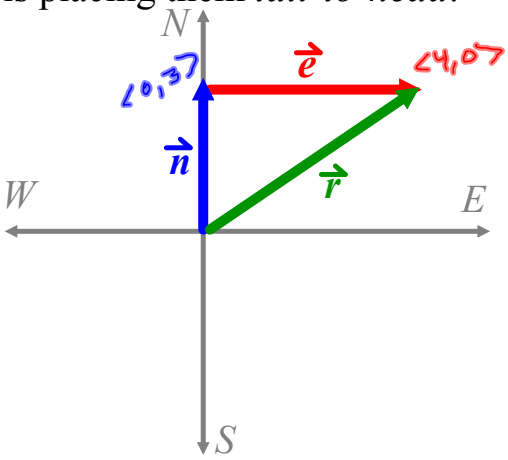

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$\vec{n}$ = <?, ?>

\+

$\vec{e}$ = <?, ?>

(remember, ordered pair is w/tail at origin)

$\vec{r}$ = <?, ?>

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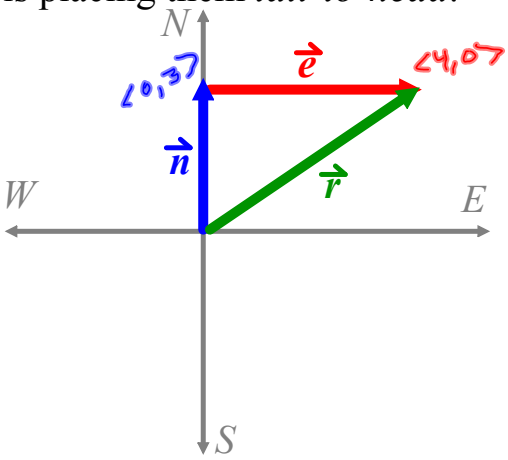

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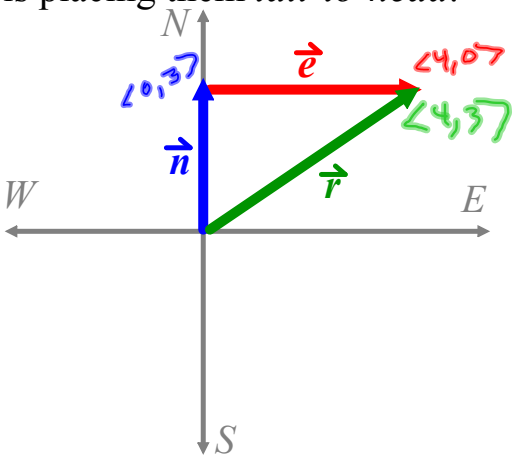

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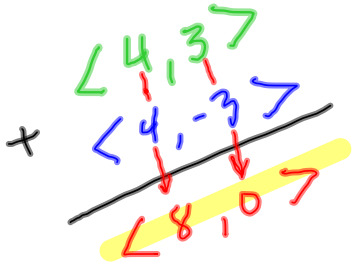
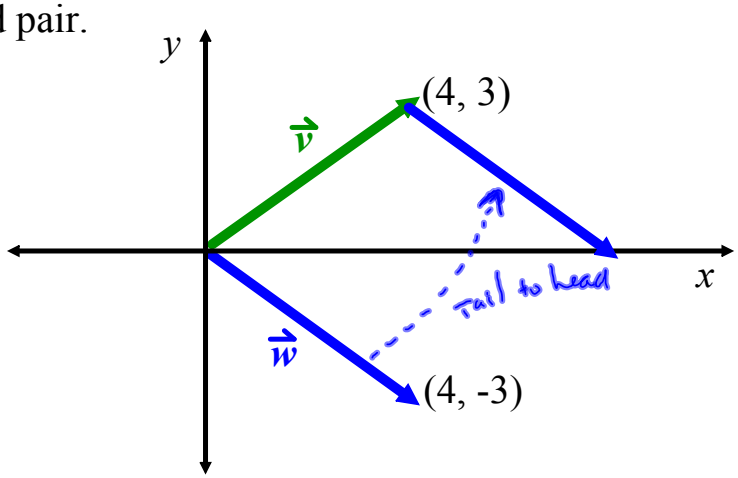
Example: Adding vectors

L9.4

Vectors $\vec{v}$ <4, 3> and $\vec{w}$ <4, -3> are shown.
Write $\vec{s}$ (their sum) as an ordered pair.





Practice: Adding vectors L9.4

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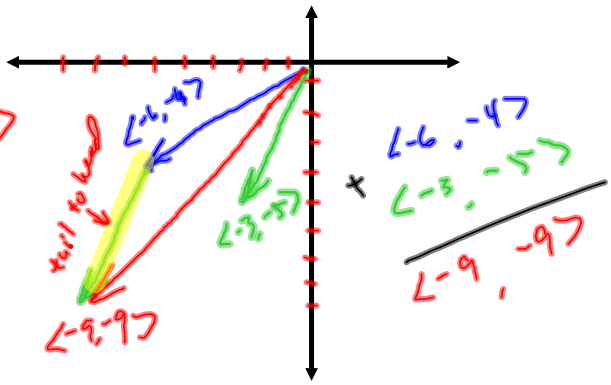
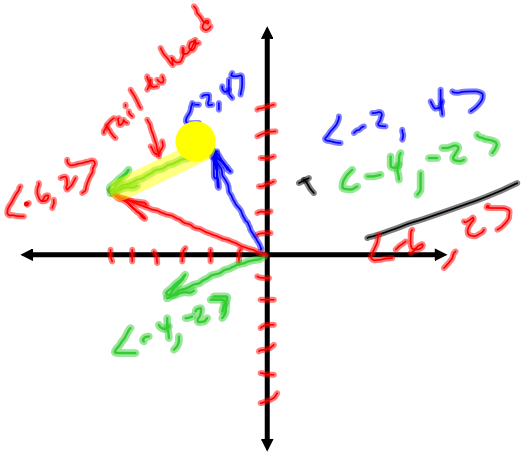
17 $\langle -9, -9 \rangle$



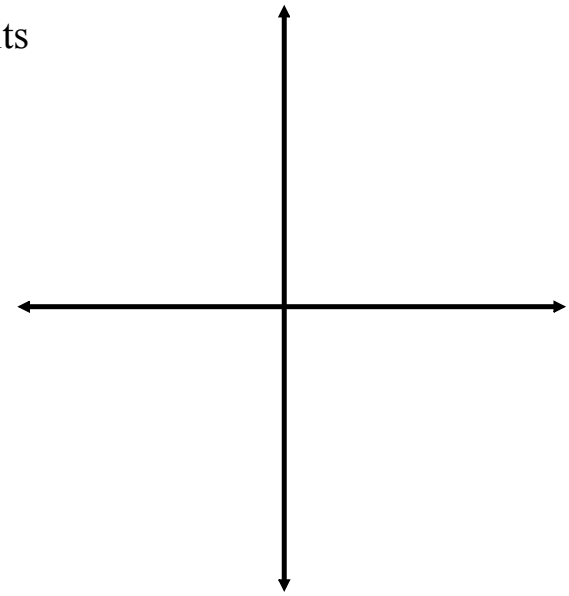
18 $\langle -6, 2 \rangle$



Example: Adding vectors L9.4

An airplane's speed is 250*mph* in still air.
The wind is blowing due east at 20*mph*.

If the airplane heads due north, what is its resultant speed and bearing (direction)?
(*round to nearest unit*)



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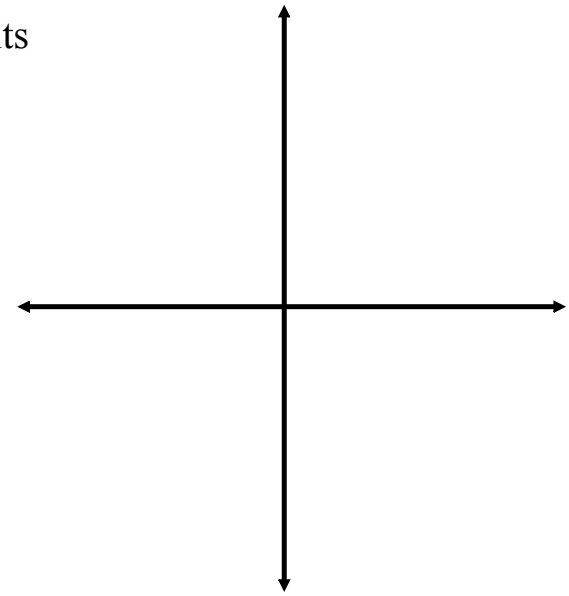

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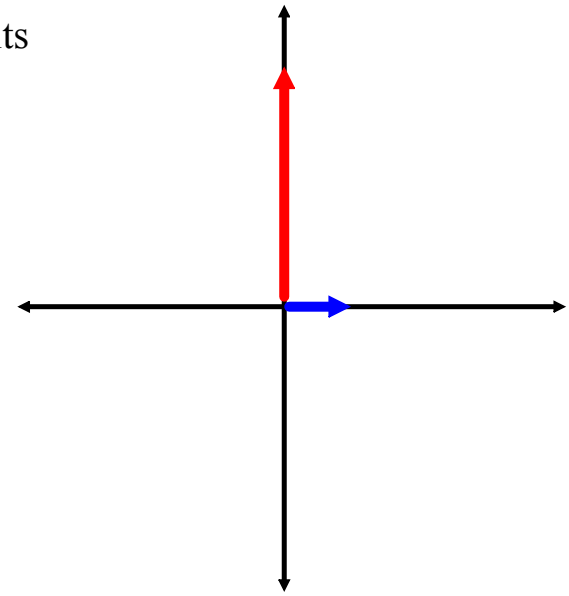

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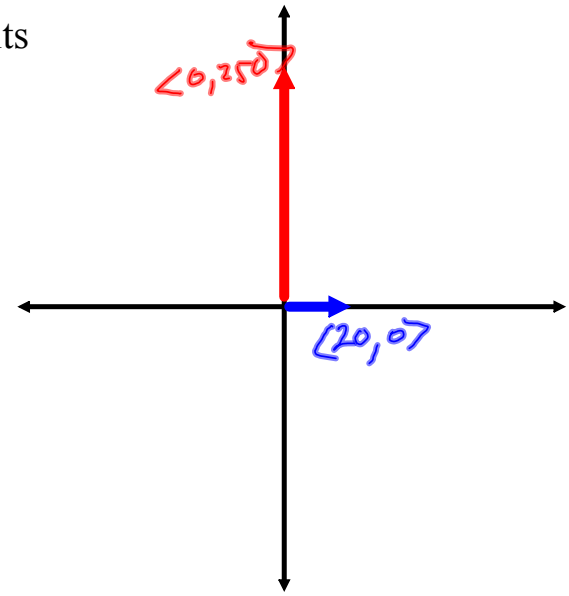

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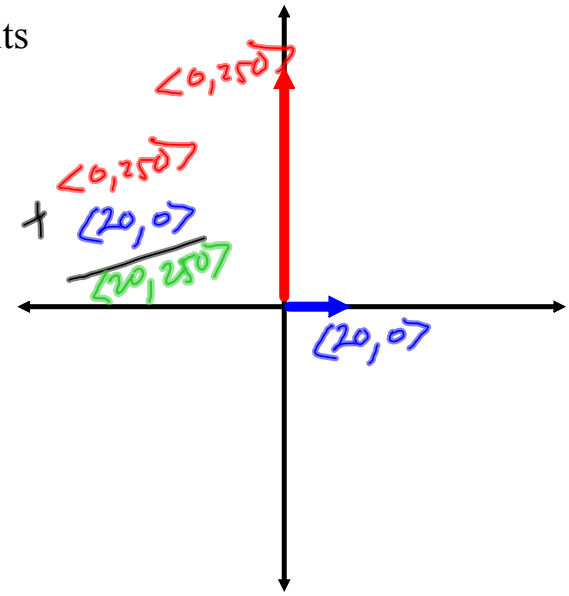

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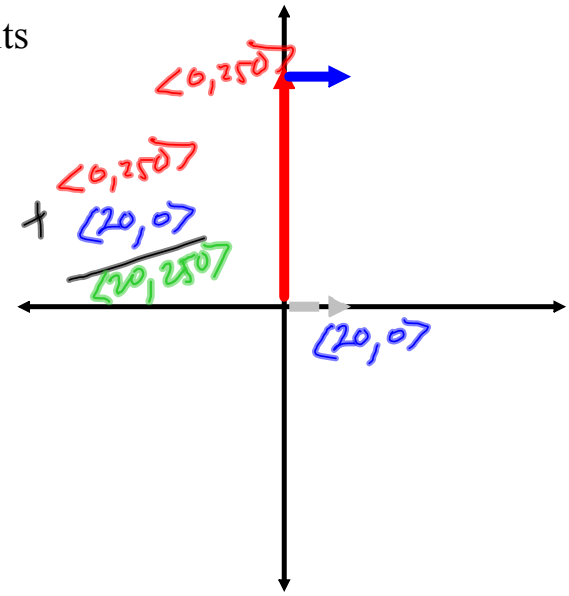

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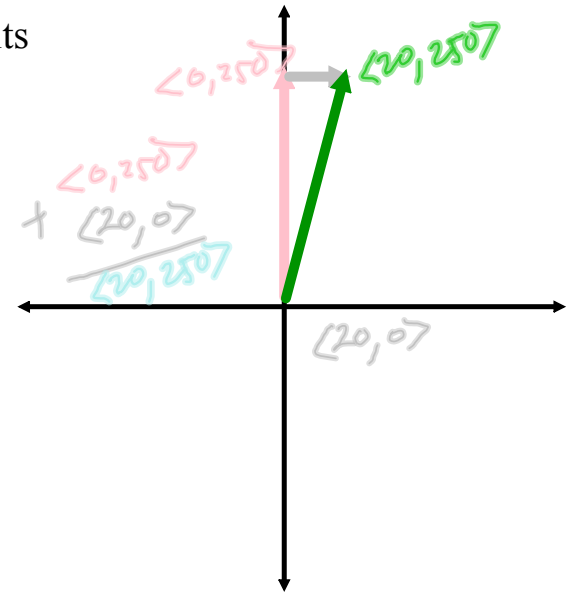

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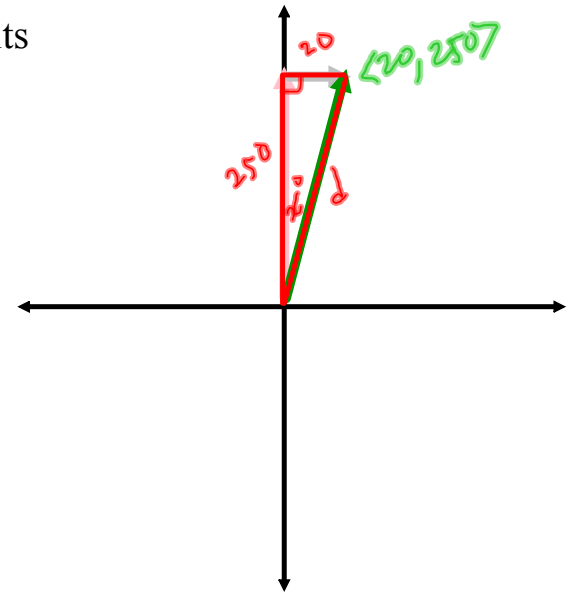

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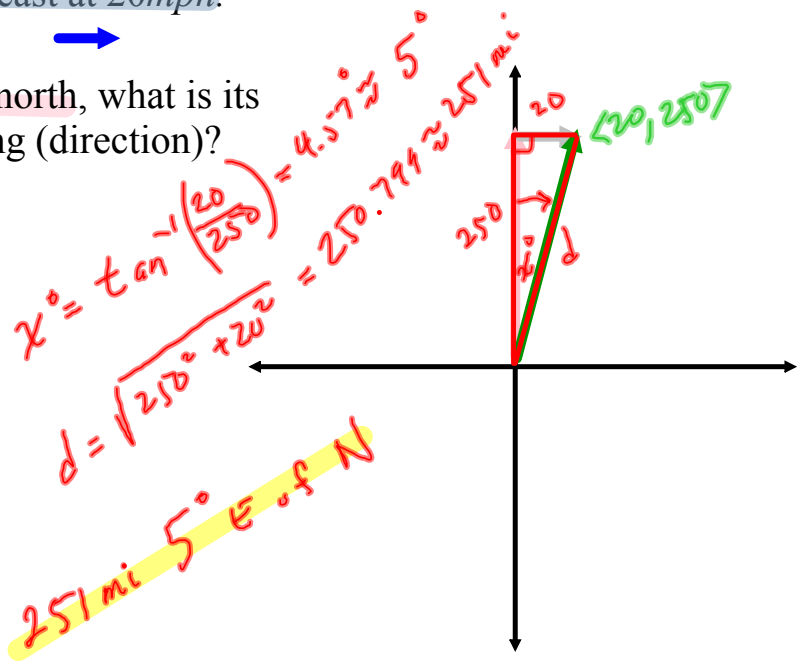

HW problems L9.4

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