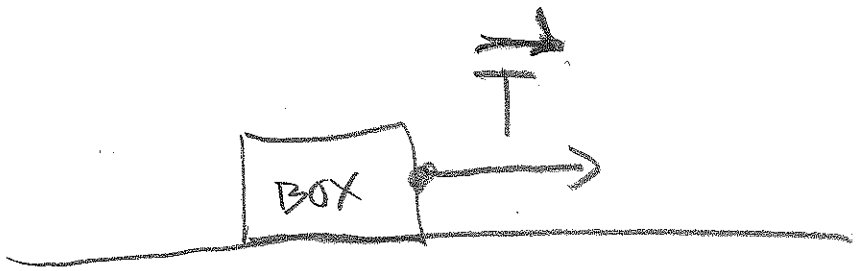
8-21-13

(3.) Tension continued

$\vec{T} \neq 0$ (taut)

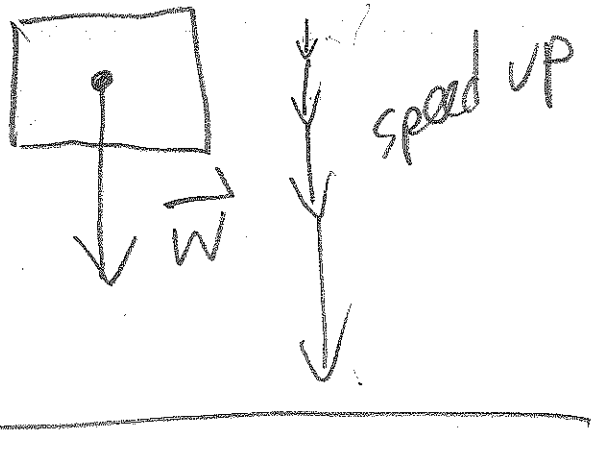
$\vec{F}$ = applied force



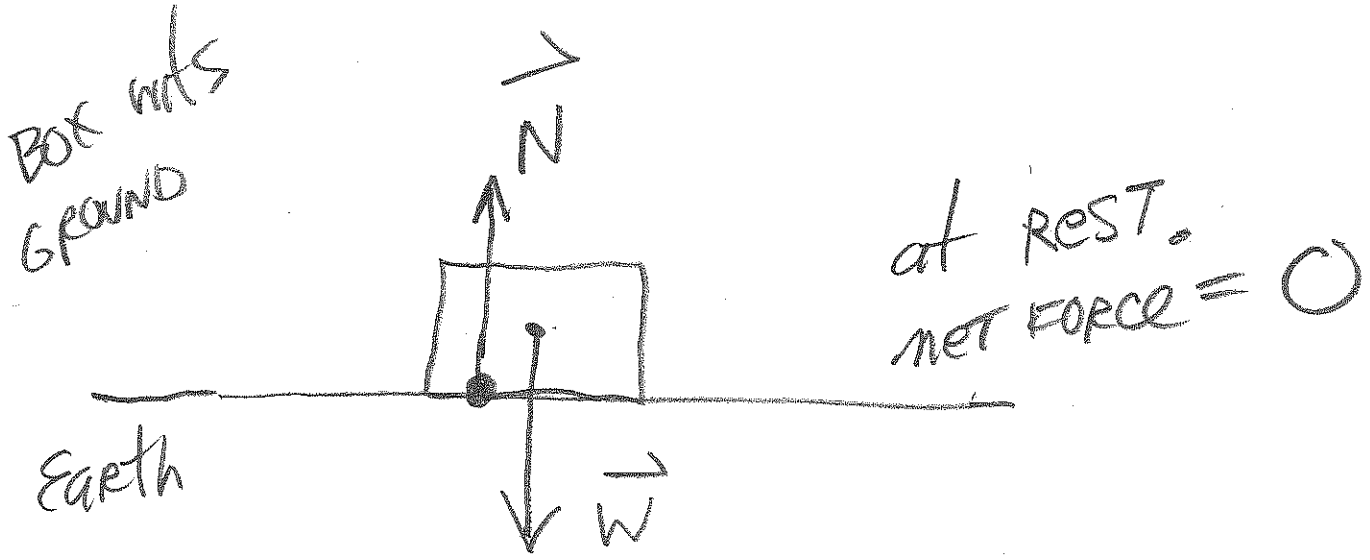
(4.) Weight (due to gravity)

fig 4.2

DROP a BOX:



(4.) weight



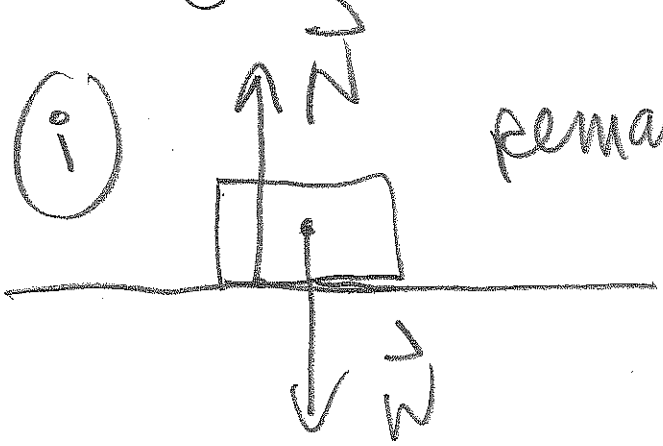
4.2 Newtons 1st Law

2 "natural" states of motion

(a) at rest

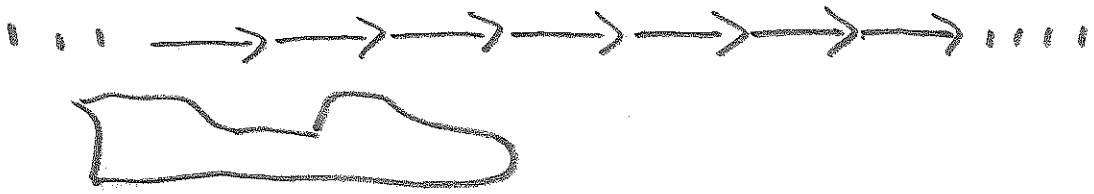
(b) motion in a straight line at constant speed (UNIFORM MOTION)

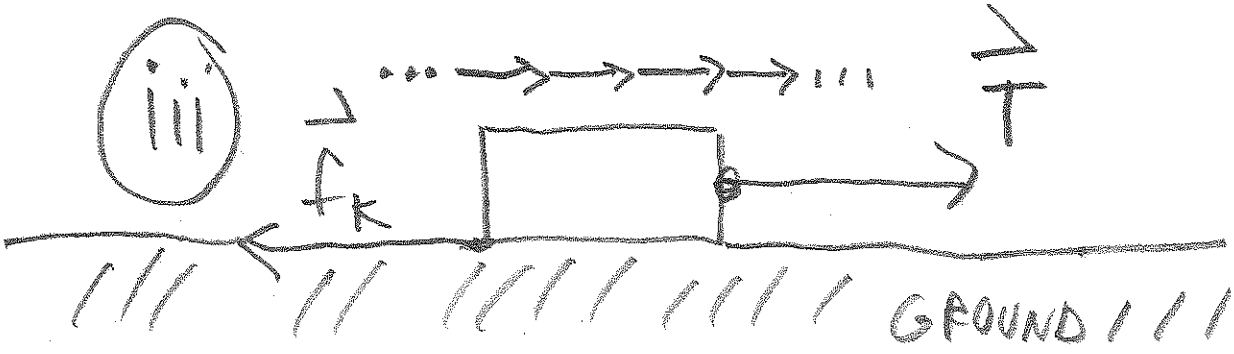
1ST LAW: an object remains in either state if the net force = 0.

(i) 

remains at rest

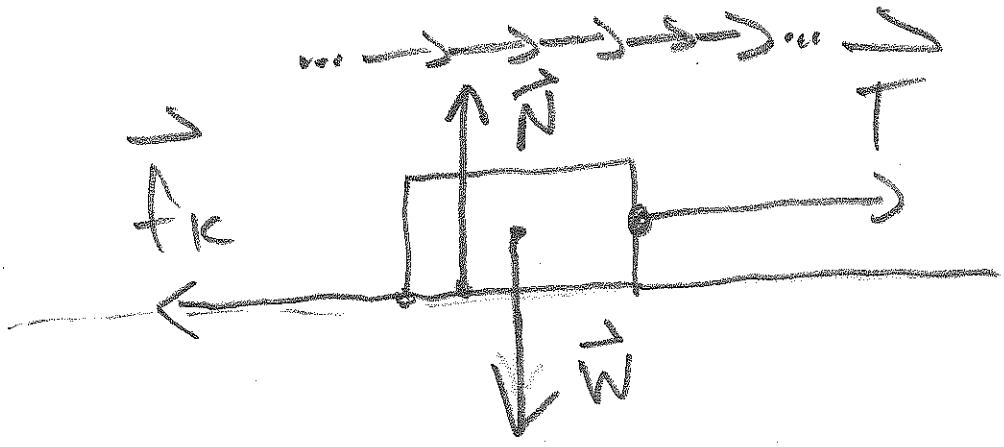
(ii) SPACE SHIP IN OUTER SPACE. (net FORCE = 0)



(iii) 

page 103

Natural state (b)



NET FORCE = 0

$$\vec{f}_K + \vec{T} = 0$$

$$\vec{W} + \vec{N} = 0$$

$$\vec{R} = \Sigma \vec{F} = 0$$

$$\vec{R} = \Sigma \vec{F} = \vec{f}_K + \vec{T} + \vec{W} + \vec{N} = 0$$

What keeps an object in natural state (b) (uniform motion) if net force = 0?

Answer: inertia

Inertia is the property of objects with mass.

Inertia is the tendency to resist a change in the state of motion.

Vectors in CHI (sec 1.7, 1.8)

Scalars: (magnitude)

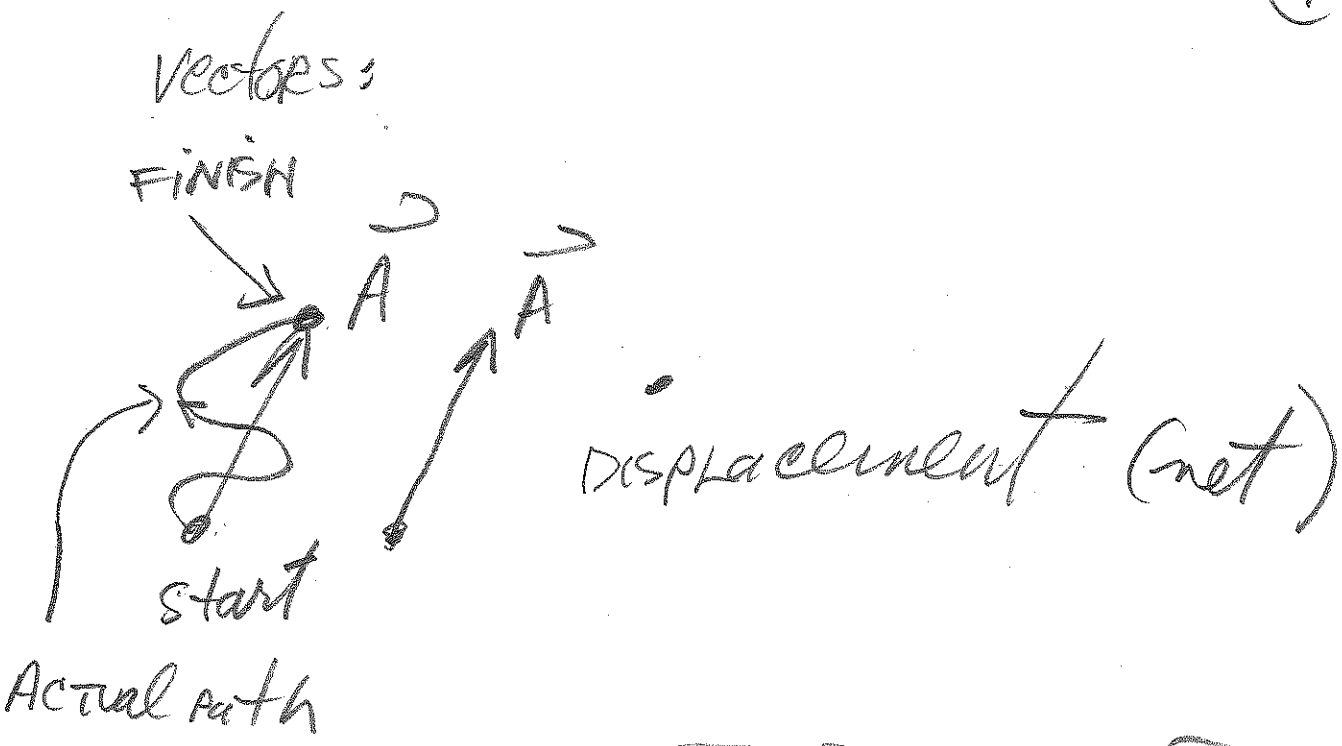
- temperature
- mass
- distance
- time
- volume
- density = $\frac{\text{mass}}{\text{volume}}$
- speed = $\frac{\text{distance}}{\text{time}}$
- area
- Electric CHARGE
- PERIMETER

vectors:

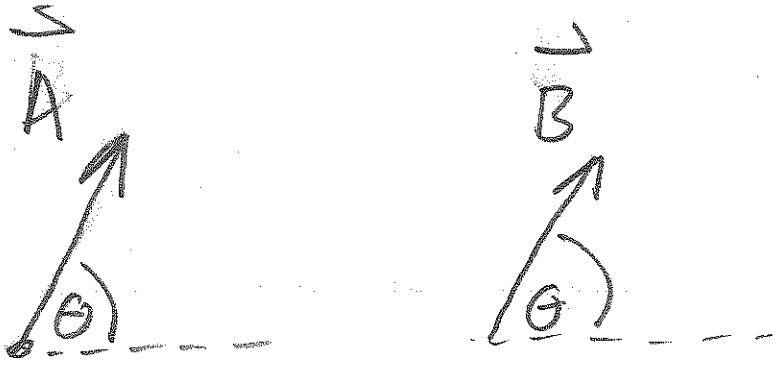
(magnitude + direction)

- Force:
  weight (down)
  tension, etc.
- velocity
  = speed, direction
- acceleration
  = rate of change of velocity
- displacement

Vectors:



- 2 equal vectors: $\vec{A}$ and $\vec{B}$



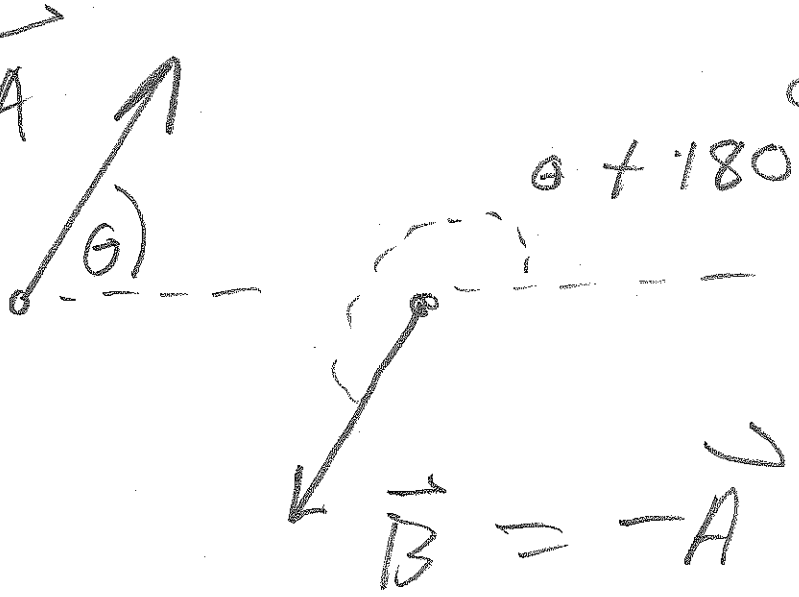
$$\vec{A} = \vec{B}$$

Same θ and magnitude.

length of ARROW

- opposite vectors

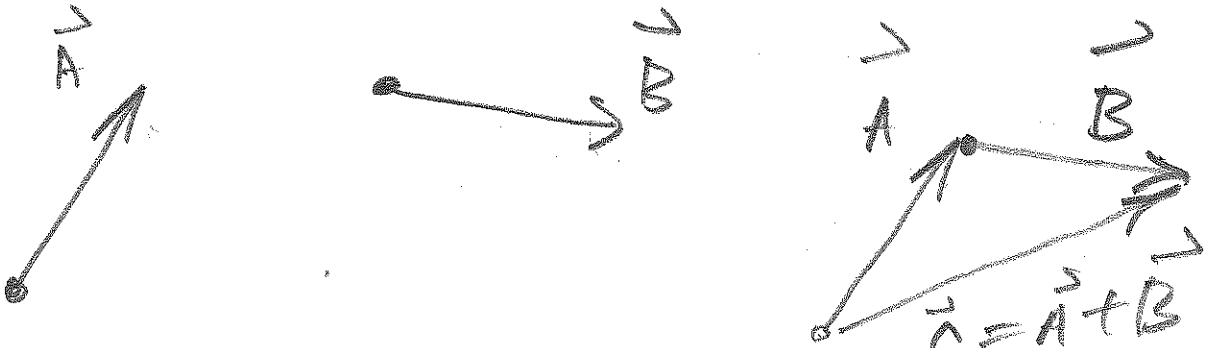
$\vec{A} = -\vec{B} \iff \vec{B} = -\vec{A}$



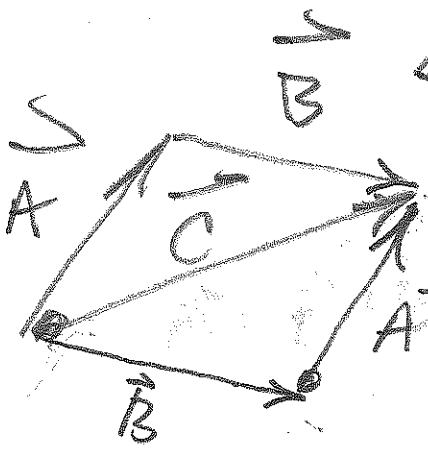
same magnitudes.

NOTE: $|\vec{A}| = A$ = magnitude of $\vec{A}$.

- vector addition: $\vec{C} = \vec{A} + \vec{B}$



parallelogram method:



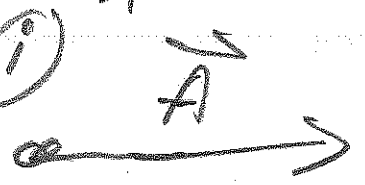
parallelogram

$$\vec{C} = \vec{B} + \vec{A}$$

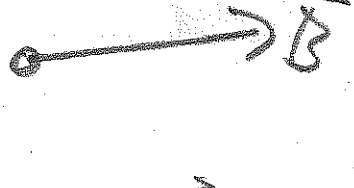
Vector addition is commutative.

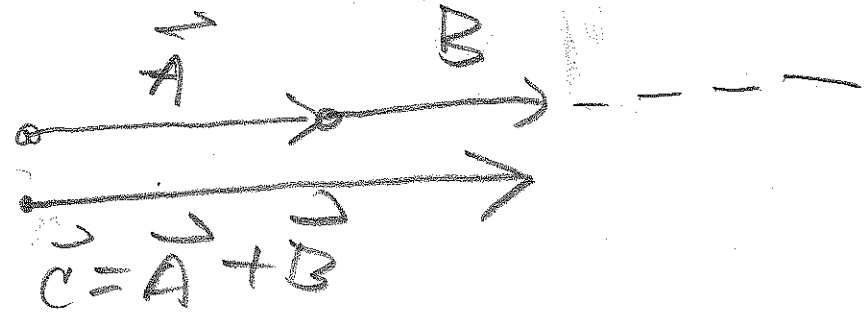
special cases: addition.

(i) co-linear vectors

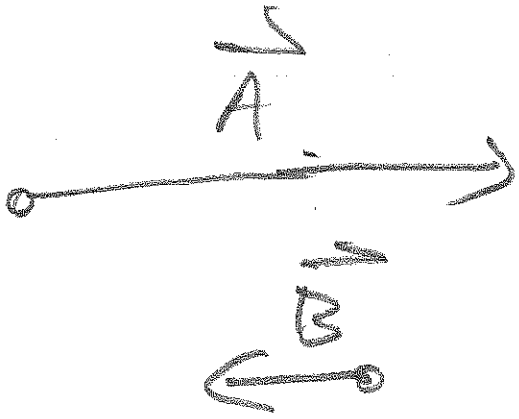


$\vec{A} + \vec{B}$

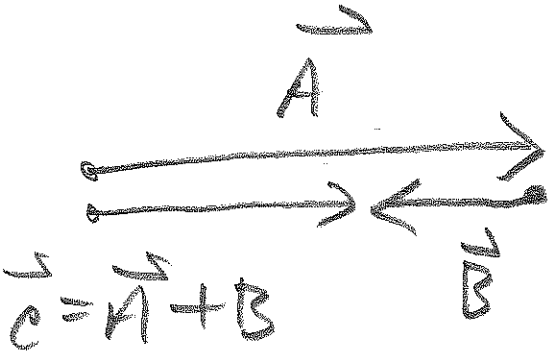




NOTE: $|\vec{C}| = |\vec{A}| + |\vec{B}|$

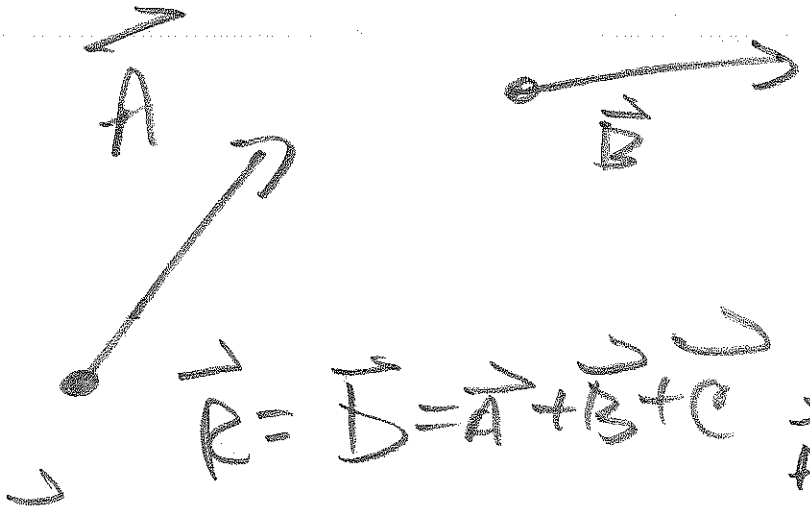


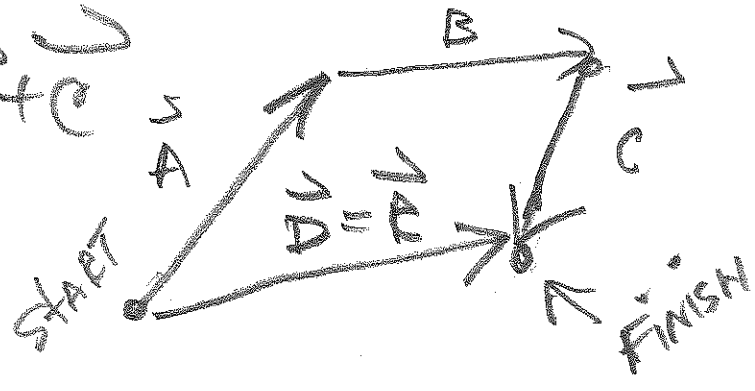
co-linear, opposite directions.



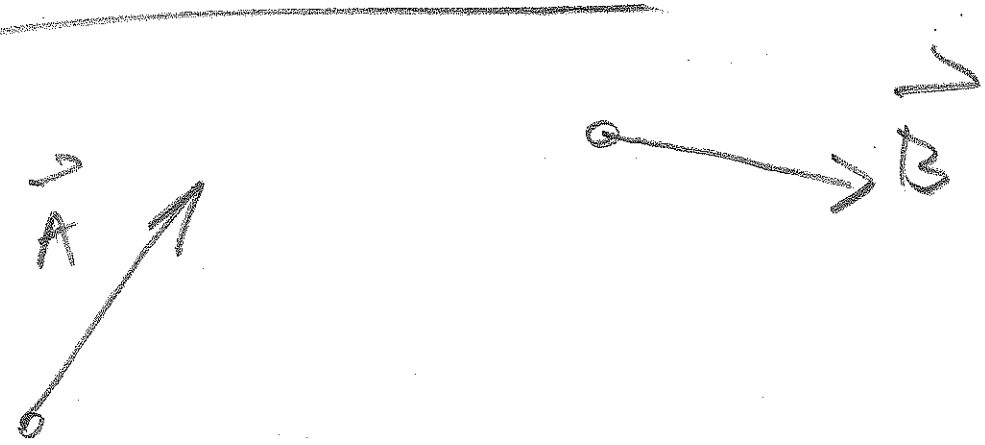
note: $|\vec{C}| = |\vec{A}| - |\vec{B}|$

ADD 3 vectors



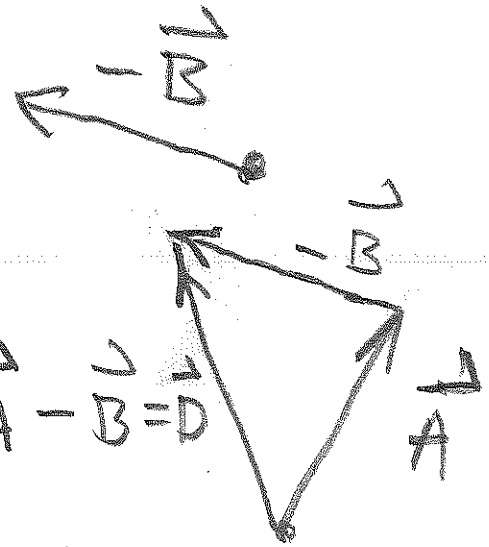


• Vector subtraction:



$\vec{A} - \vec{B} = ?$

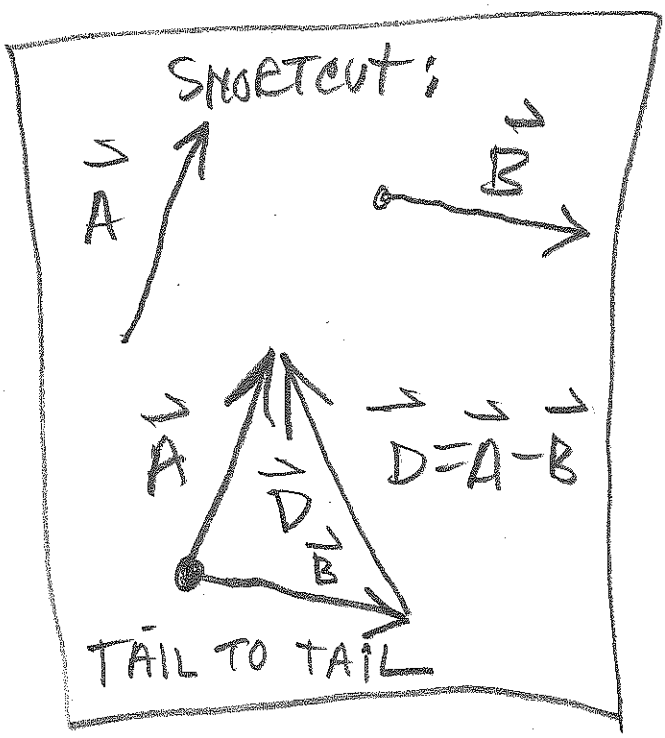
answer: $\vec{A} - \vec{B} = \vec{A} + (-\vec{B})$

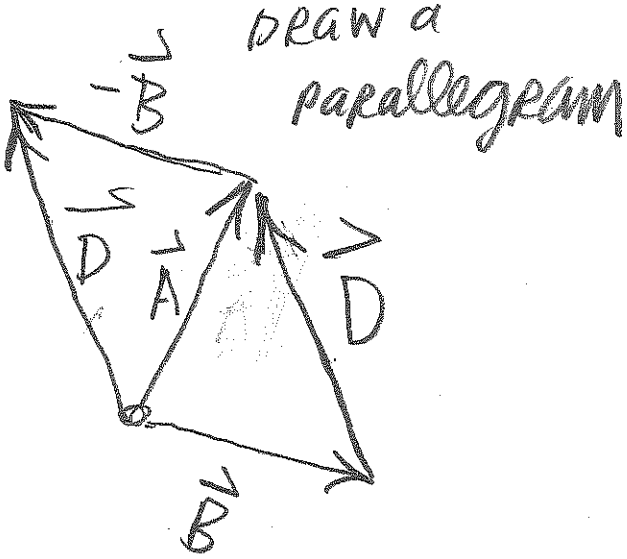


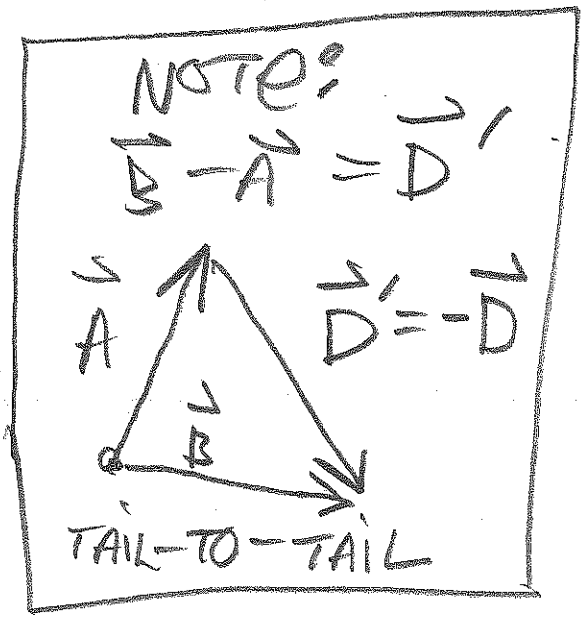
$\vec{A} + (-\vec{B}) = \vec{A} - \vec{B} = \vec{D}$

$\vec{D}$ = difference

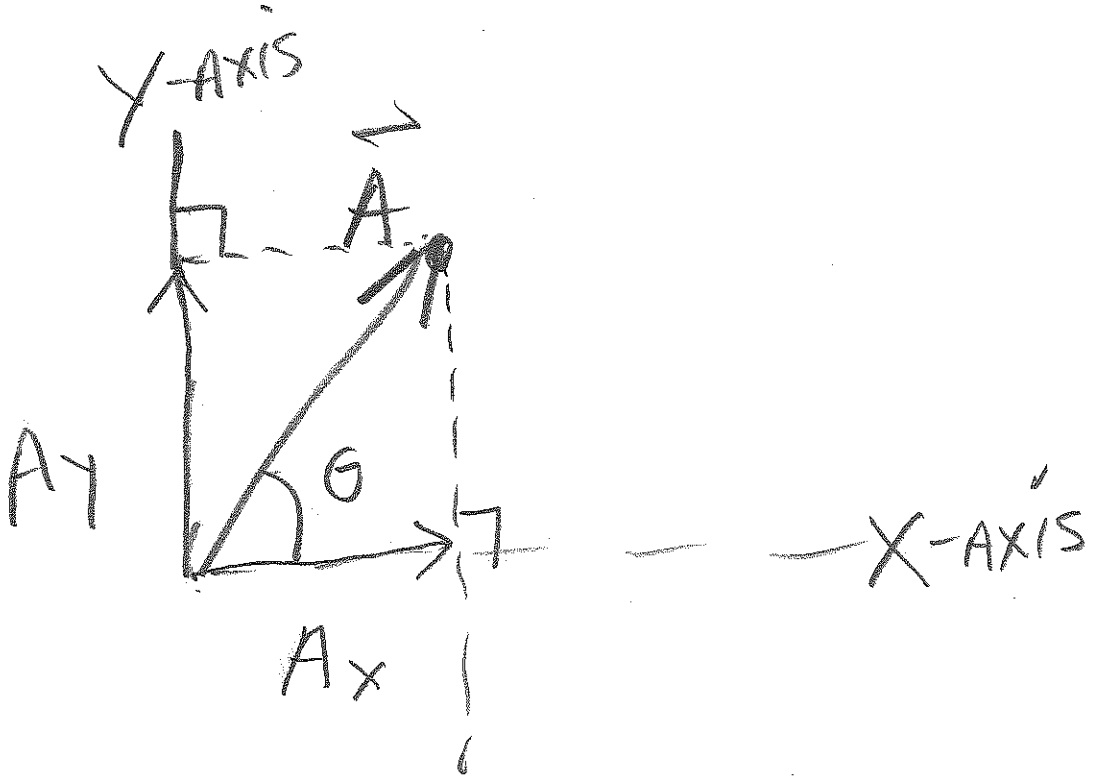
Shortcut for SUBTRACTION (12







Next: Sec 1.8 components



website: mvaphysics.com