Physics 200

Day 2

masteringphysics

I'll explain this in a moment.

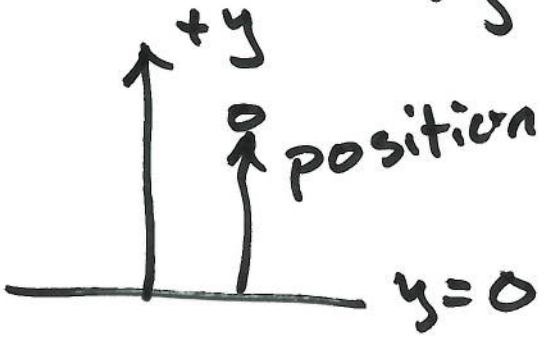
Course ID CI Fall 2017
select Knight Physics for Sci & Eng 3rd edition.

Physics 200 has a PLTL which will be awesome! Join if you can.
11-1 Solano Rm 1174
Tuesdays

Today: vectors adding motion in 1-D

Vectors:

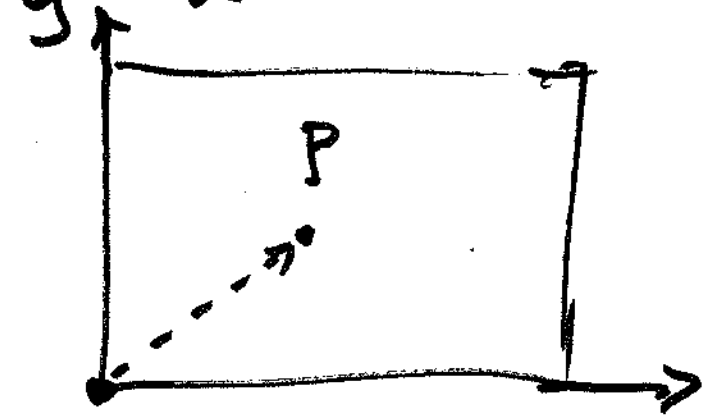
In 1-D: direction specified by +/- sign.



velocity > 0 moving up
velocity < 0 moving down.

Vectors in 2-d:

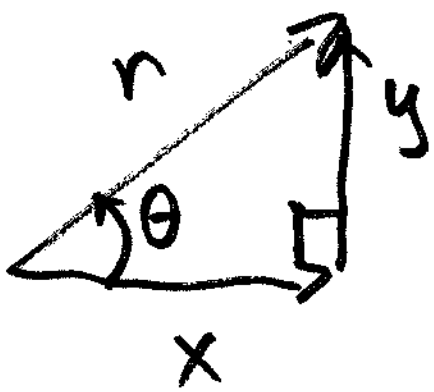
wee robot floor classroom only.
Position can be specified by 2 numbers.



of P specified by (x,y) or $x\hat{x} + y\hat{y}$
called rectangular (or Cartesian) form

location of P can be specified in Polar form: length and angle from $+\hat{x}$
direction: ↳ r ↖ θ ∠

Given: (x,y) find: (r,θ)



Use SOH CAH TOA

$\sin = \frac{opp}{hyp}$ $\cos = \frac{adj}{hyp}$

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

$r^2 = x^2 + y^2$

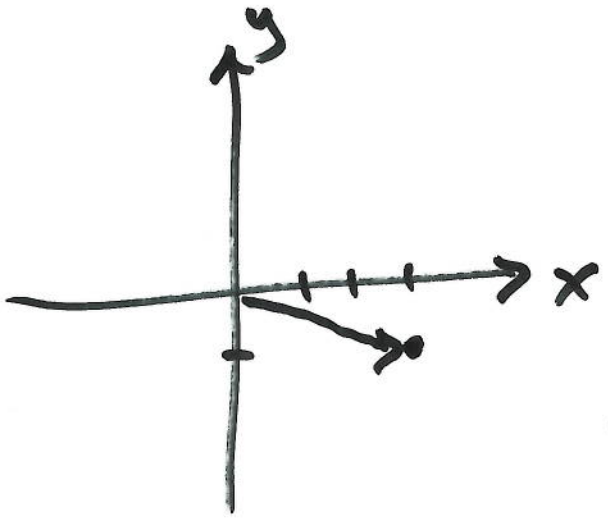
$r = \sqrt{x^2+y^2}$

$\tan\theta = \frac{y}{x}$

$\theta = \text{Tan}^{-1}\left(\frac{y}{x}\right)$

↑ arctan

add 180° if $x<0$



$x=3$ and $y=-1$

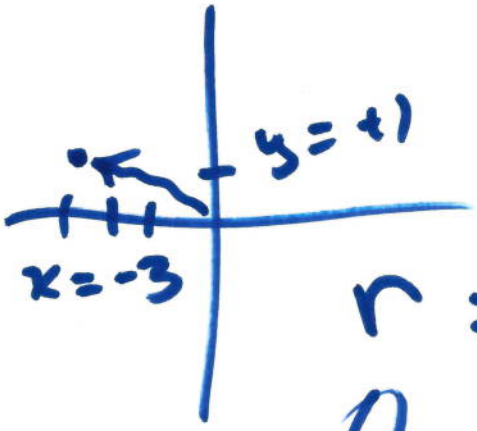
Convert to polar

$r = \sqrt{3^2 + (-1)^2}$

$= \sqrt{10}$

$\theta = \text{Tan}^{-1}\left(\frac{-1}{3}\right) = -18.4°$

~~Now,~~ Now, Now,

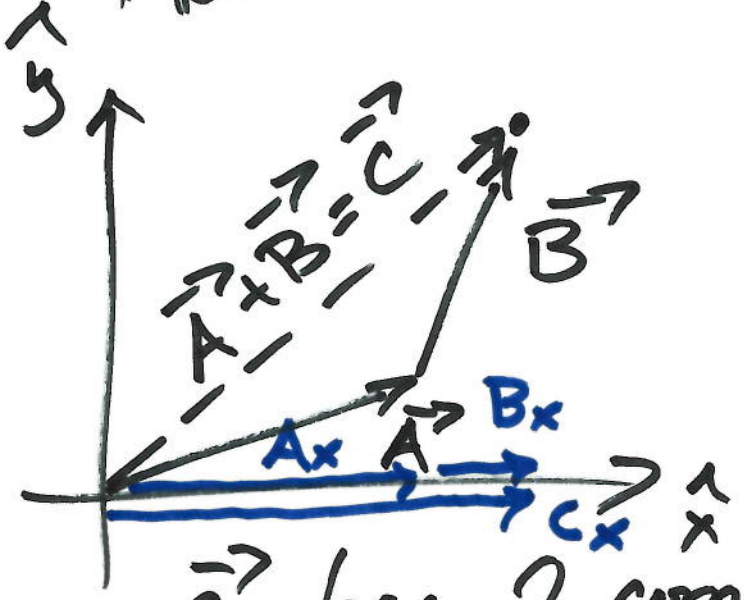


$r = \sqrt{(-3)^2 + 1^2} = \sqrt{10}$

$\theta = \text{Tan}^{-1}\left(\frac{1}{-3}\right) = -18.4°$

add 180° : since $x<0$: $\theta = 161°$

Add vectors:



$\vec{C}$ has 2 components: (C_x, C_y)

or: $C_x \hat{x} + C_y \hat{y}$

or: $C_x \hat{i} + C_y \hat{j}$

$\vec{A} = (A_x, A_y)$

$\vec{B} = (B_x, B_y)$

$C_x = A_x + B_x$

and

$C_y = A_y + B_y$

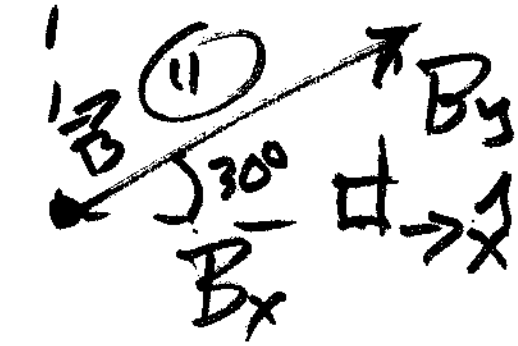
If $\vec{A}$ or $\vec{B}$ are given in polar, convert them to rectangular 1st.

let $\vec{A} = 4\hat{x} + 9\hat{y}$

and $\vec{B} = 11$ at $30°$

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

1st: Convert $\vec{B}$ to rectangular form:



$B_x =$ $\qquad$ $B_y =$

$\sin = \frac{opp}{hyp} = \frac{B_y}{11}$

$\sin 30° = \frac{B_y}{11}$

$B_y = B \sin\theta$

$= 11 \underbrace{\sin 30°}_{1/2} = 5.5$

$\cos\theta = \frac{adj}{hyp} = \frac{B_x}{B}$

$B\cos\theta = B_x$

$11 \cos 30° = 9.53 = 9.5$

$C_x = A_x + B_x$

$= 4 + 9.5 = 13.5$

$C_y = A_y + B_y = 9 + 5.5 = 14.5$

Motion in 1-D:

Position: vector is called "Displacement" from origin. Magntude: is distance from O.

Velocity: vector. magnitude is Speed.

acceleration: vector. change in $\vec{v}$ per time. magnitude is called: the magnitude of $\vec{a}$.

for velocity: $\vec{v}$

for acceleration: $\vec{a}$

position: could be x, y, r or s

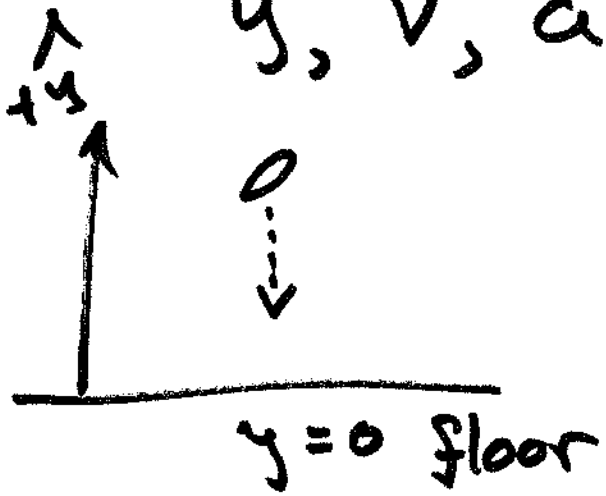
units: metric (SI) units

position: meter (m)

velocity: $\frac{\text{meter}}{\text{second}}$ $\left(\frac{m}{s}\right)$

acceleration: $\frac{\text{meter}}{\text{second}^2}$ $\left(\frac{m}{s^2}\right)$

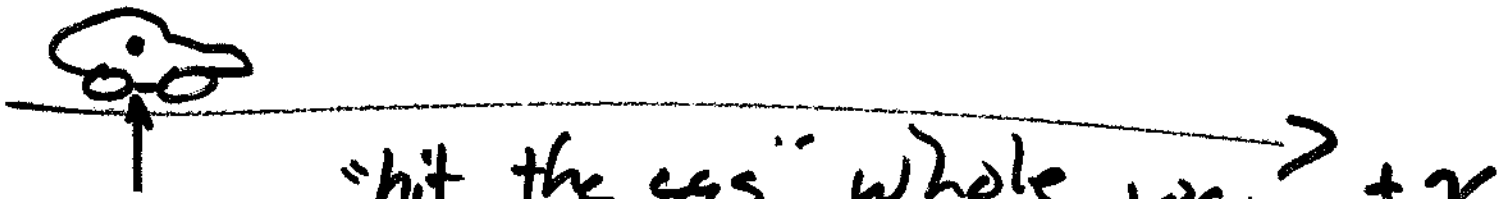
As pen falls, what is sign of $\vec{y}$, $\vec{v}$, $\vec{a}$ vectors?



$\vec{y} > 0$

$\vec{v} < 0$ moving down

$\vec{a} < 0$ accel. down.



"hit the gas" whole way.

what are ± signs of:

x	v	a
+	+	+ ← all ⊕ ... tricky...

when sign of v and a agree, you speed up.

when sign $\vec{v}$, $\vec{a}$ oppose, you slow down.

when $\vec{v} \perp \vec{a}$, you turn