

MONDAY, NOV 21, 2005

ALL PHYSICS CLASSES

Make Sure You have BOOK, CALCULATOR from NOW ON.

FIRST:

Read Through Vector Math notes (also Read Section 3-2)

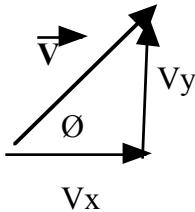
DO Vectors and Scalars AND Vector3 sheet.... Groups is OK, but practice individually!

READ example of Part IV vector lab: vector race and start in class:

TUE/WED finish part I & II of vector lab.... Part III, IV at home?

VECTOR MATH:

Instead of solving graphically, we can use math: BUT STILL DRAW A PICTURE!!!
We like RIGHT triangles, because then we can use trig functions.



$$\begin{aligned} \text{Pythagorean: } V^2 &= V_x^2 + V_y^2 \\ V_x &= V \cos(\theta) \\ V_y &= V \sin(\theta) \\ \theta &= \tan^{-1}(V_y/V_x) \end{aligned}$$

SO: (sample 3A pg 90) I climb a hill that is 136 m high and 230 m wide, what is my displacement?????

The Y is 136 m, The X is 115 m (half the width of the hill).

So the displacement is the hypoteneuse: $D^2 = X^2 + Y^2$ $D = \text{sqrt} (136^2 + 115^2) = 178 \text{ m}$

The angle to the horizontal is $\theta = \tan^{-1}(Y/X) = \tan^{-1}(136/115) = 49.8^\circ$ above the horizontal

If we know the vectors and want to find the X and Y components: (Sample 3B pg 93)

I travel 95 km/hr at an angle of 35° above the ground.... How fast do I go up, how fast do I go over?

$$\begin{aligned} \cos(\theta) &= \text{Adj/Hyp} = V_x/V \quad \text{so } V_x = V \cos(\theta) & V_x &= 95 \cos(35^\circ) = 54 \text{ km/hr} \\ \sin(\theta) &= \text{Opp/Hyp} = V_y/V \quad \text{so } V_y = V \sin(\theta) & V_y &= 95 \sin(35^\circ) = 78 \text{ km/hr} \end{aligned}$$

Combining the two is like solving the golf problem:

Separate each vector into X & Y components.... Add up all the X's and Y's.... Get the two legs of one big right triangle. Solve for the hypoteneuse vector and angle of the right triangle. (Sample Problem 3C pg 95)

NOW: DO Vectors and Scalars AND Vector3 sheet

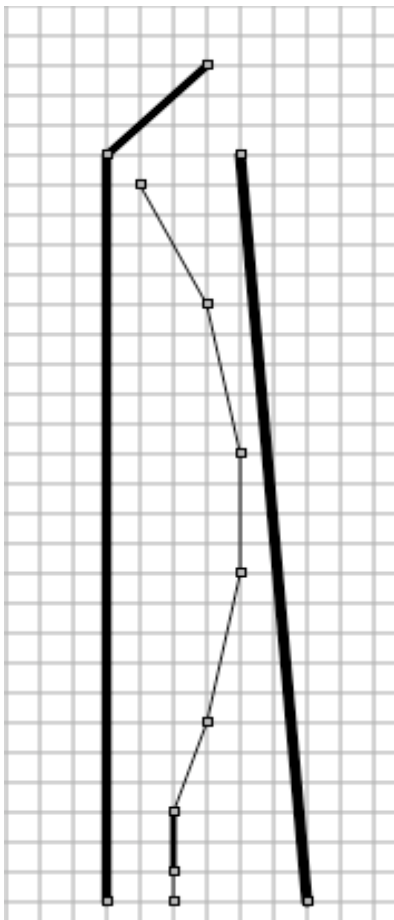
EXAMPLE VECTOR RACE FOR VECTOR LAB PART 4.

RULES:

Can only accelerate 1 sq per turn in x & y direction.

Crash when end up at or over wall. (if the hypoteneuse ends up in wall)

TURN	Last TurnX	Possible X moves	Last Turn Y	PossibleY moves	Move
0	0	-1, 0 , +1	0	-1, 0, + 1	0, +1
1	0	-1, 0 , +1	+1	0 , +1, +2	0, +2
3	0	-1, 0 , +1	+2	+1, + 2 , +3	+1, +3
4	+1	0 , +1, +2	+3	+2, + 3 , +4	+1,+4
5	+1	0 , +1, +2	+4	+3, + 4 , +5	0,+4
6	0	-1, 0 , +1	+4	+3, + 4 , +5	-1,+5
7	-1	-2, -1, 0	+5	+4, +5, +6	-2,+4
8	-2	-3, -2, -1	+4	+3, + 4 , +5	crash!!!
9					



START!