Sept 14, 2015

Should ~~have a rule~~ 1

Homework

2

End of class: vote: proj vs. board

Homework this week: on common course webpage

12.1: Idea: if something is hard to understand in 3-d, try 2-d or 1-d.

12.2: Vectors:

E.g. $\langle 2,1\rangle$ in 2-d

$\langle -1,3,0\rangle$ in 3-d

This week 12.3, 12.4 5

In 12.3 we will see why unit vectors are useful...

12.3 Dot Product:

$\vec{a}\cdot\vec{b} = \langle a_1,a_2,a_3\rangle \cdot \langle b_1,b_2,b_3\rangle$

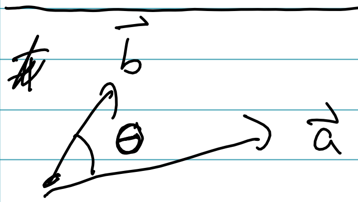
$= a_1 b_1 + a_2 b_2 + a_3 b_3$

$\langle 1,2,3\rangle \cdot \langle 4,5,6\rangle$

$= \langle 1\cdot 4, 2\cdot 5, 3\cdot 6\rangle = \cancel{\langle 4,10,18\rangle}$

$= 4+10+18 = 14+18 = 32$

6

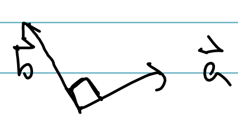


$$\boxed{\vec{a}\cdot\vec{b} = |\vec{a}|\cdot|\vec{b}|\cdot(\cos\theta)}$$

$\vec{a} \perp \vec{b}$ if

(1) $\vec{a}\cdot\vec{b} = 0$

(2) $\theta = \pm 90^\circ$

(3) 

orthogonal, perpendicular

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$\boxed{4}$

Force, Velocity $= \dfrac{\text{Displacement}}{\text{Time}}$

$|\langle a_1, a_2\rangle| = \sqrt{a_1^2 + a_2^2}$

$|\langle a_1, a_2, a_3\rangle| = \sqrt{a_1^2 + a_2^2 + a_3^2}$

Vector $\vec{a}$, unique unit vector $\vec{u} = \vec{a} / |\vec{a}|$ which

① points in the dir. of $\vec{a}$

② has length 1.

$\boxed{3}$

Should have a reasonable to add & scale vectors:

$\langle 1,2\rangle + \langle 3,4\rangle = \langle 1+3, 2+4\rangle$

$= \langle 4,6\rangle$

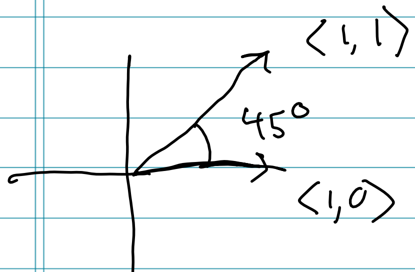
$5 \cdot \langle 1,2\rangle = \langle 5,10\rangle$

Displacement:

from $(3,9)$ to $(7,1)$

$+4, -8 \rightsquigarrow \langle 4,-8\rangle$

$\boxed{8}$



$\cos(45°) = 1/\sqrt{2}$

... ?

$|\langle 1,0\rangle| = 1$

$|\langle 1,1\rangle| = \sqrt{1+1} = \sqrt{2}$

$\langle 1,0\rangle \cdot \langle 1,1\rangle = 1\cdot 1 + 0\cdot 1$

$= 1$

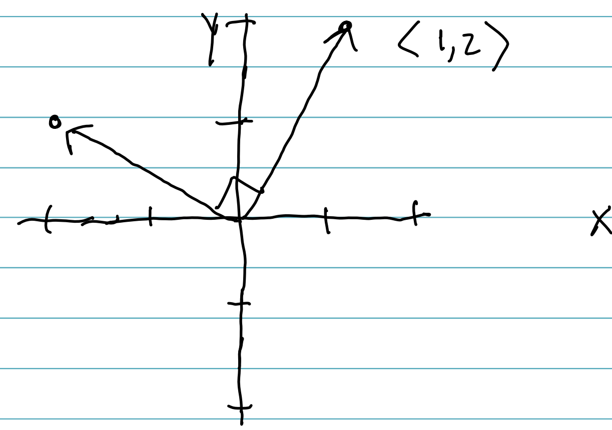
$\vec{a} \cdot \vec{b} = |\vec{a}|\,|\vec{b}| \cos\theta$

$\boxed{7}$

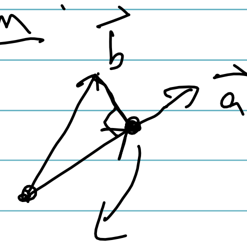
$\langle 1,2\rangle \cdot \langle -2,1\rangle$

$= (1)(-2) + (2)(1) = -2+2 = 0$

$\langle 1,2\rangle \perp \langle -2,1\rangle$

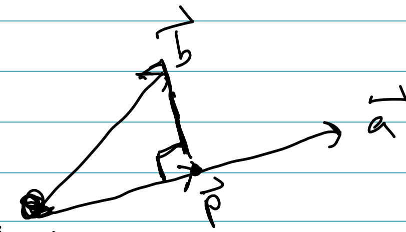


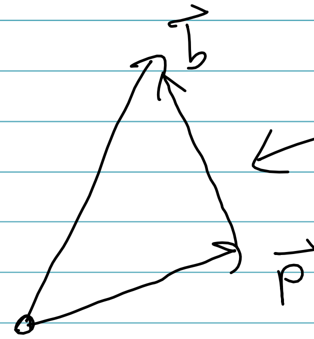
Projection:



$\text{proj}_{\vec{a}}\vec{b}$ = "part of $\vec{b}$ can be explained by $\vec{a}$"

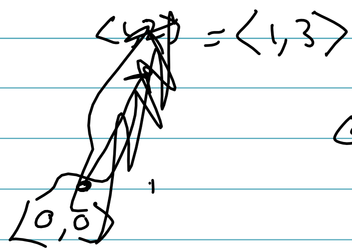
= closest vector to $\vec{b}$ that points in the direction of $\vec{a}$

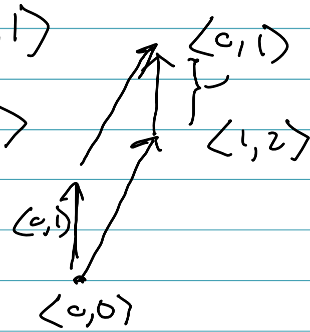




?? ? $(\vec{b} - \vec{p})$

$\langle 1,2 \rangle + \langle 0,1 \rangle$





$\langle 1,2 \rangle + \langle 0,1 \rangle = \langle 1+0, 2+1 \rangle = \langle 0,1 \rangle + \langle 1,2 \rangle$