WARM UP

Read the first paragraph on p. 438 and answer the following:

Give an example each of scalar multiplication and vector addition. Are your solutions scalars or vectors? $3\langle -2, 5\rangle = \langle -6, 15\rangle$

The vector operation we're studying today is called the Dot Product. This operation will yield a Scalar (scalar or vector?).

53

Dec 2-3:58 PM

Coming up in Pre-Calc (3 1/2 more weeks!)...

This week: Finish Chapter 6 except 6.5 day 1 and 2

Next week: Monday 6.5 day 1, Tuesday 6.5 day 2, and Ch. 6 Test on Friday
Mathematician is due Thursday

Week after that: Chapter 9

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Definition of the dot product of **u** and **v**:

$\vec{u} = \langle u_1, u_2\rangle$

$\vec{v} = \langle v_1, v_2\rangle$

$\vec{u}\cdot\vec{v} = u_1v_1 + u_2v_2$

numerical # (Scalar)

EX. Find $\vec{u}\cdot\vec{v}$ if $\vec{u} = \langle -3, 4\rangle$ *and* $\vec{v} = \langle 2, -5\rangle$

$\vec{u}\cdot\vec{v} = (-3)(2) + 4(-5)$

$= -6 + -20$

$= -26$

p. 445: #1 (HW)

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Example

Let **v** = <-3, 4>. (a) Find the dot product of **v** with itself.
(b) Find ||**v**||. (c) What can you conclude?

a) $\langle -3, 4\rangle\langle -3, 4\rangle$

$(-3)(-3) + (4)(4)$

$9 + 16$

25

b) $||v|| = \sqrt{(-3)^2 + (4)^2}$

$= \sqrt{25}$

$= 5$

p. 445: #11 (HW)

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Angle Between Two Vectors: (Know this formula for test)

$$\cos\theta = \frac{\vec{u}\cdot\vec{v}}{\|\vec{u}\|\|\vec{v}\|}$$

HINT

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Example

Find the angle between $\vec{u} = \langle 4,3\rangle$ and $\vec{v} = \langle 3,5\rangle$.

$\cos\theta = \dfrac{\vec{u}\cdot\vec{v}}{\|\vec{u}\|\cdot\|\vec{v}\|}$

$\vec{u}\cdot\vec{v} = (4)(3)+(3)(5)$
$= 12 + 15$
$= 27$

$\|\vec{u}\| = \sqrt{4^2+3^2}$
$= 5$

$\|\vec{v}\| = \sqrt{3^2+5^2}$
$= \sqrt{34}$

$\cos\theta = \dfrac{27}{5\sqrt{34}}$

$\theta = \cos^{-1}\left(\dfrac{27}{5\sqrt{34}}\right)$

$\theta = 22.17°$

p. 445: #19 (HW)

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HOMEWORK

... the underlined portion is what we completedtoday...

6.4 (p. 445): 1-31 (odd), 33-37 (odd), 53, 55

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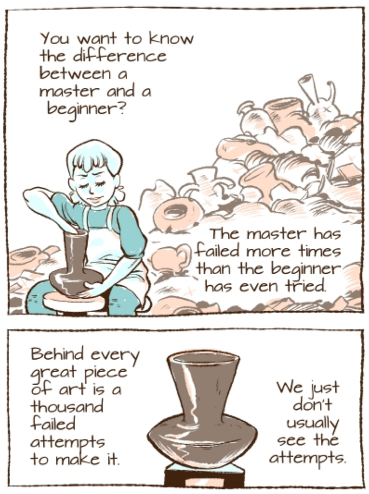

Dec 3-8:13 AM

Angle Between Two Vectors **u** and **v**:

$$\cos\theta = \frac{\vec{u}\cdot\vec{v}}{\|\vec{u}\|\|\vec{v}\|} \qquad \text{or} \qquad \theta = \cos^{-1}\frac{\vec{u}\cdot\vec{v}}{\|\vec{u}\|\|\vec{v}\|}$$

Q: What would need to be true in order for **u** and **v** to be perpendicular?
(Hint: What would θ need to equal?)
A:

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Look at the 5 different options for θ drawn on p. 440.
We will focus on the 3rd possibility...

Definition. The vectors **u** and **v** are "orthogonal" (perpendicular) if ________________.

Dec 2-5:02 PM

Example
Determine if the two vectors are orthogonal.

$$\vec{u} = \langle 10, 4\rangle$$
$$\vec{v} = \langle 2, -5\rangle$$

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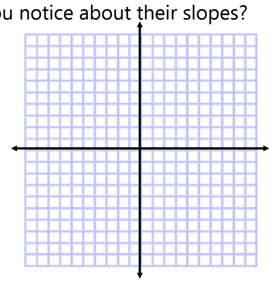
Q: Can you figure out the condition necessary for two vectors **u** and **v** to parallel? Hint: What do you notice about their slopes?
A:



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Example

Determine whether or not **u** and **v** are parallel.

$\vec{u} = \langle 8, 4 \rangle$

$\vec{v} = \langle -2, -1 \rangle$

p. 445: #33 (HW)

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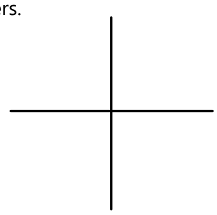
Example

Find two vectors in opposite directions that are orthogonal to vector $\vec{u} = \langle -7, 5 \rangle$. There are many answers.



p. 446, #53 (HW)

Dec 2-5:13 PM

HOMEWORK

...due tomorrow; the underlined portion is what we completed today...

6.4 (p. 445): 1-31 (odd), 33-37 (odd), 53, 55

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Nov 5-8:40 AM