Initial (-3,1) Terminal (4,5)

$\langle 4-(-3), 5-1 \rangle$

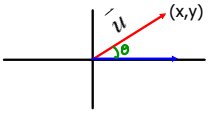
$\langle 7, 4 \rangle$

$7i+4j$

Oct 29-10:32 AM

Direction Angle of a Vector

Let unit vector **u** have a terminal point (x,y) on the unit circle:



θ is the angle measured from the positive x-axis (initial side) to the vector (terminal side).

$x = \cos\theta$
$y = \sin\theta$

$\mathbf{u} = \langle \cos\theta, \sin\theta \rangle$

$\cos\theta\, i + \sin\theta\, j$

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Suppose that **u** is a unit vector with direction angle θ.
If **v**=a**i**+b**j** is any vector that makes an angle θ with the positive x-axis, then it has the same direction as **u** and you can write:

V = length of v • unit vector u

$= \|v\| \langle \cos\theta, \sin\theta \rangle$

$= \|v\| (\cos\theta\, i + \sin\theta\, j)$

Direction θ

+180°	+0
+180°	+360°

$\theta = \tan^{-1}\left(\frac{y}{x}\right) + A$

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Example

Find the magnitude and direction angle, θ, for **v** = -12**i** + 15**j**.

$\|\vec{v}\| = \sqrt{(-12)^2 + (15)^2}$

$= \sqrt{144+225}$

$= \sqrt{369}$

Direction angle

$\theta = \tan^{-1}\left(\frac{15}{-12}\right) + 180$

$= 128.66°$

p. 434, #63 (HW)

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Example

Find the magnitude and direction angle given

$$\vec{v} = 8(\cos 135^o \vec{i} + \sin 135^o \vec{j})$$

easy!

$\|\vec{v}\| = 8$

$\theta = 135°$

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Example

Find the component form of the sum of **u** and **v** with direction angles $\theta_u = 30°$ and $\theta_v = 90°$ given $\|u\| = 2$ *and* $\|v\| = 2$

Note: **u** is NOT a unit vector in this problem. The magnitude $\neq 1$.

$\vec{u} = 2(\cos 30° i + \sin 30° j)$

$= 2(\frac{\sqrt{3}}{2} i + \frac{1}{2} j)$

$= 2\langle \frac{\sqrt{3}}{2}, \frac{1}{2} \rangle$

$\vec{u} = \langle \sqrt{3}, 1 \rangle$

$\vec{v} = 2(\cos 90° i + \sin 90° j)$

$= 2(0i + 1j)$

$= 2\langle 0, 1 \rangle$

$\vec{v} = \langle 0, 2 \rangle$

p. 434, #73 (HW)

$\langle \sqrt{3}, 1 \rangle + \langle 0, 2 \rangle$

$\langle \sqrt{3}, 3 \rangle$ or $\sqrt{3}\vec{i} + 3\vec{j}$

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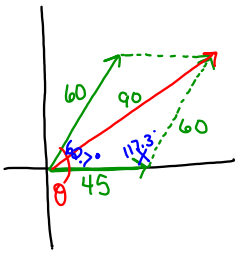
Let's talk through #81 together...

Force = magnitude

Force 1: 45 lbs

Force 2: 60 lbs

Resultant: 90



Law of cosines

$x = \cos^{-1}\left(\frac{45^2 + 60^2 - 90^2}{2(45)(60)}\right)$

$x = 117.3°$

$180 - 117.3° = 62.7°$

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HOMEWORK

...all of 6.3 will be due Monday; the underlined portion is what we went over today...

6.3 (p. 433): 1-33 (odd), 35-59 (odd), 61-81 (odd, omit 77)

Nov 24-10:42 PM