p. 433

6-3 UNIT VECTORS

Properties of Vectors - p.428

$\boldsymbol{u} + \boldsymbol{v} = \boldsymbol{v} + \boldsymbol{u}$	$(c + d)\boldsymbol{u} = c\boldsymbol{u} + d\boldsymbol{u}$
$(\boldsymbol{u} + \boldsymbol{v}) + \boldsymbol{w} = \boldsymbol{u} + (\boldsymbol{v} + \boldsymbol{w})$	$c(\boldsymbol{u} + \boldsymbol{v}) = c\boldsymbol{u} + c\boldsymbol{v}$
$\boldsymbol{u} + \boldsymbol{0} = \boldsymbol{u}$	$1(\boldsymbol{u}) = \boldsymbol{u}$
$\boldsymbol{u} + \boldsymbol{-u} = \boldsymbol{0}$	$0(\boldsymbol{u}) = 0$
$c(d\boldsymbol{u}) = (cd)\boldsymbol{u}$	$\|cv\| = \|c\|\|v\|$

Unit vector - vector of magnitude 1

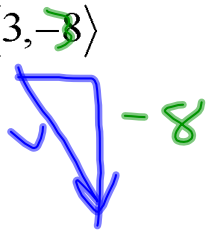
$$u = \frac{v}{\|v\|}$$

Standard unit vectors: $i = \langle 1,0 \rangle$

$j = \langle 0,1 \rangle$

So $\langle 5,-3 \rangle = ?$ $5i - 3j$

Ex 1 Find a unit vector in the direction of $v = \langle 3,-8 \rangle$



$\|v\| = \sqrt{3^2 + (-8)^2}$

$= \sqrt{9 + 64}$

$\sqrt{73}$

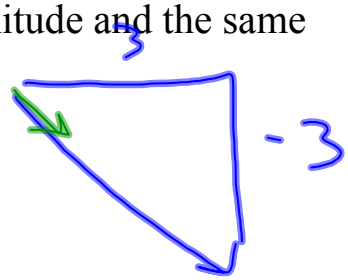
unit vector $= \left\langle \frac{3}{\sqrt{73}}, \frac{-8}{\sqrt{73}} \right\rangle$

Ex 2 Find a unit vector in the direction of $v = \langle 4, -3 \rangle$

unit vector $= \left\langle \frac{4}{5}, \frac{-3}{5} \right\rangle$

Ex 3 Find the vector $\boldsymbol{v}$ with the given magnitude and the same direction as $\boldsymbol{u}$

$\|v\| = 4 \qquad u = \langle 3, -3 \rangle$



$$\|u\| = \sqrt{3^2 + (-3)^2}$$
$$= \sqrt{9+9}$$
$$= \sqrt{18}$$
$$= 3\sqrt{2}$$

unit vector $= \left\langle \frac{3}{3\sqrt{2}}, \frac{-3}{3\sqrt{2}} \right\rangle$

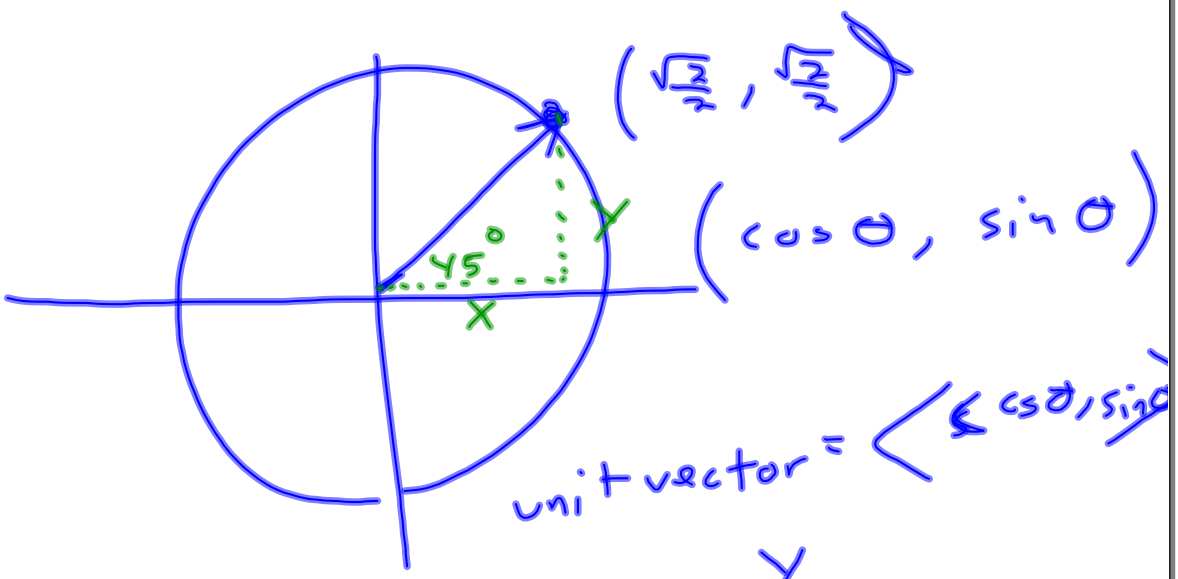
$\left\langle \frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}} \right\rangle$

$\left\langle \frac{4}{\sqrt{32}}, -\frac{4}{\sqrt{32}} \right\rangle$

Ex 4 Find the vector $\boldsymbol{v}$ with the given magnitude and the same direction as $\boldsymbol{u}$

$\|v\| = 3 \qquad u = \langle 2, 5 \rangle$

How does this relate to the unit circle?



unit vector = $\langle \cos\theta, \sin\theta \rangle$

$\tan\theta = \frac{Y}{X}$

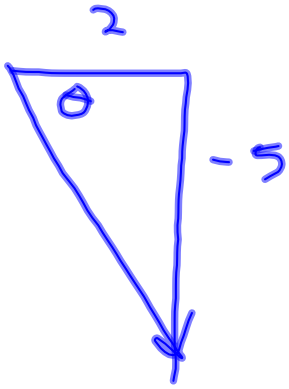
direction angle = θ

Ex 5 Find the magnitude and direction angle of

$\boldsymbol{v} = 2\boldsymbol{i} - 5\boldsymbol{j}$ or $v = \langle 2, -5 \rangle$

$\|v\| = \sqrt{2^2 + (-5)^2}$

$= \sqrt{29}$

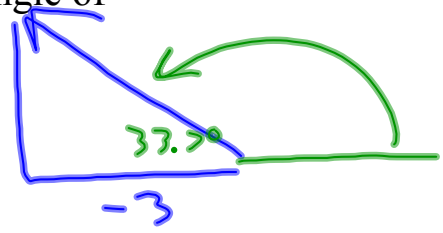


$\tan\theta = \frac{-5}{2}$

$\theta \approx -68.2^\circ$

Ex 6 Find the magnitude and direction angle of

$\boldsymbol{v} = -3\boldsymbol{i} + 2\boldsymbol{j}$ or $v = \langle -3, 2 \rangle$



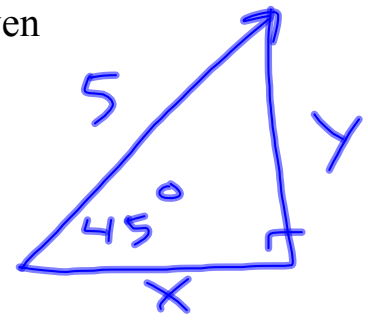
$\|v\| = \sqrt{13}$

$\tan\theta = \frac{2}{-3}$

$\theta \approx -33.7^\circ$

$\theta \approx 146.3^\circ$

Ex 7 Find the component form of $\boldsymbol{v}$ given $\|v\| = 5$ and $\theta = 45°$

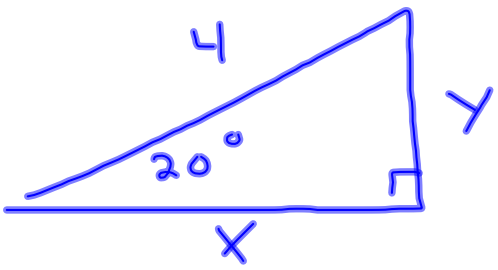


$\cos 45° = \frac{x}{5}$

$x \approx 3.5$

$\langle 3.5, 3.5 \rangle$

Ex 8 Find the component form of $\boldsymbol{v}$ given $\|v\| = 4$ and $\theta = 20°$



$\sin 20° = \frac{y}{4}$

$\cos 20° = \frac{x}{4}$

$\langle 3.8, 1.4 \rangle$

Homework
p.434
#35-53, 63-69 odds