Advanced Math

6-3

(Day 2)

Vectors in a Plane

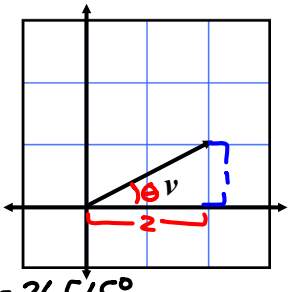
General unit vector - endpoint on unit circle

$(\cos\theta, \sin\theta)$

$\vec{i}\cos\theta + \vec{j}\sin\theta$

Trig form of a vector -

$\vec{v} = \|\vec{v}\|(\vec{i}\cos\theta + \vec{j}\sin\theta)$



Write the trig form of **v** at the right.

$\|\vec{v}\| = \sqrt{2^2+1^2} = \sqrt{5}$ $\tan\theta = \frac{1}{2} \Rightarrow \theta = \tan^{-1}\left(\frac{1}{2}\right) = 26.565°$

$\vec{v} = \sqrt{5}(\vec{i}\cos 26.565° + \vec{j}\sin 26.565°)$

Find a unit vector in the direction of the given vector. (pg. 541)

*) $w = \langle 3, 4 \rangle = 5(\vec{i}\cos 53.130° + \vec{j}\sin 53.130°)$

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

$\tan\theta = \frac{4}{3}$ $\theta = 53.13°$

unit vector: $(\vec{i}\cos 53.130° + \vec{j}\sin 53.130°)$

Note the unit vector has magnitude 1.

Find the vector v with the given magnitude and the same direction as u.

*) $\|v\| = 12$, $u = -2i - 5j = \langle -2, -5 \rangle$

$\|u\| = \sqrt{29}$ Quad III

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

$\vec{v} = 12\left(\vec{i}\cos 248.199° + \vec{j}\sin 248.199°\right)$

$\vec{v} = \left\langle \frac{12(-2)}{\sqrt{29}}, \frac{12(-5)}{\sqrt{29}} \right\rangle = \left\langle \frac{-24}{\sqrt{29}}, \frac{-60}{\sqrt{29}} \right\rangle$ or

$\theta = 68.199°$ No! $+180°$

III $248.199°$

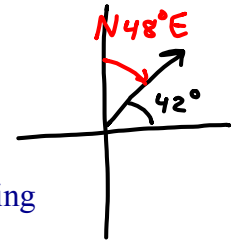
Arctan will only place answers in quadrants I and IV. You have to manually adjust the angles if they need to be in II or III by adding 180º.

Find the magnitude and direction angle of v.

*) $v = 4(\cos 42°i + \sin 42°j)$

$\|\vec{v}\| = 4$

$\theta = 42°$ or N48°E



Optional bearing notation.

Find the resultant force acting upon an object given:

Force 1: 300N at S35ºE → $300(\vec{i}\cos 305° + \vec{j}\sin 305°) = \langle 172.073, -245.746 \rangle$

Force 2: 125N at S75ºW → $125(\vec{i}\cos 195° + \vec{j}\sin 195°) = \langle -120.741, -32.352 \rangle$

Force 3: 275N at N15ºE $275(\vec{i}\cos 75° + \vec{j}\sin 75°) = \langle 71.175, 265.630 \rangle$

add

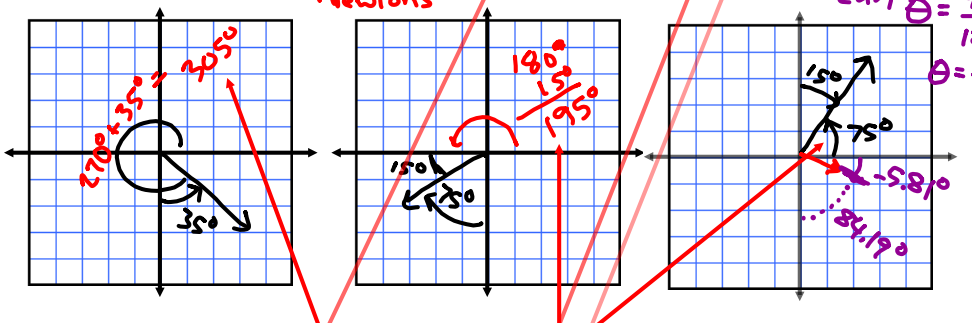
$\langle 122.507, -12.468 \rangle$

$(122.507)^2 + (-12.468)^2 = 123.140$ N @ S84.19°E ← OR

Newtons

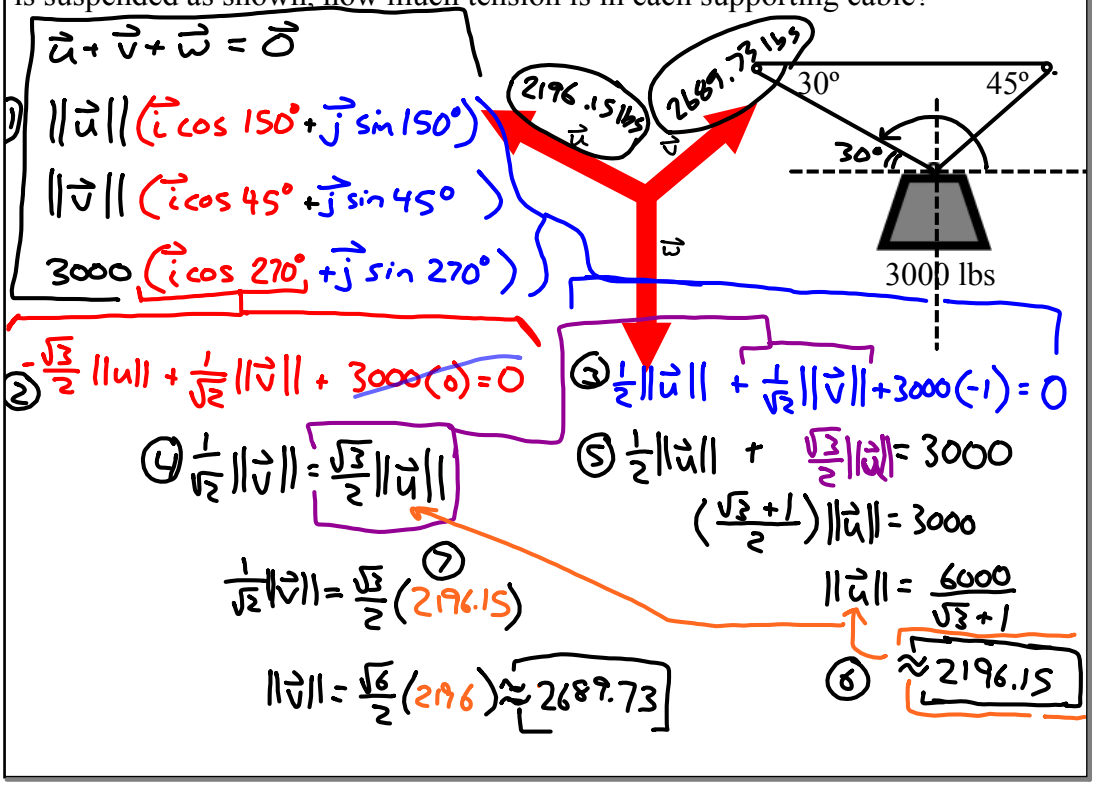
$\tan\theta = \frac{-12.468}{122.507}$

$\theta = -5.81°$



Angles need to be measured in standard notation when using the trig form.

An object is stationary if the resultant forces acting upon it = **0**. If a weight is suspended as shown, how much tension is in each supporting cable?



Assignment:
pg. 540
1-24 all,
37-42 all.