Assignments for the week of Oct 24:

- 45 minutes of Khan Academy
- Textbook problems due Wed(2nd)/Thurs(1st)

  7.3 #1-23 odd, 33,35 vector operations

  #45-51 odd dot product

Final Exams

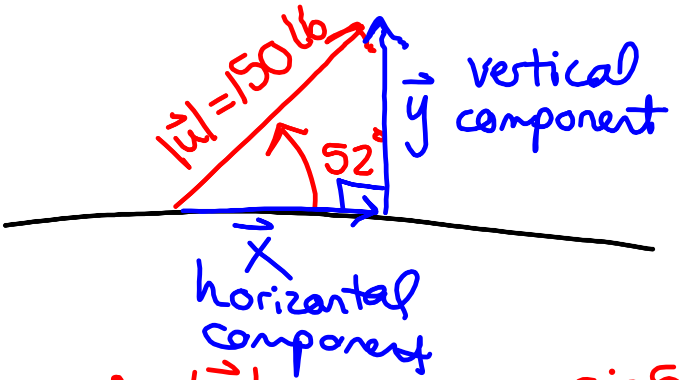
1st period: Wed. 11/2 9am-11am

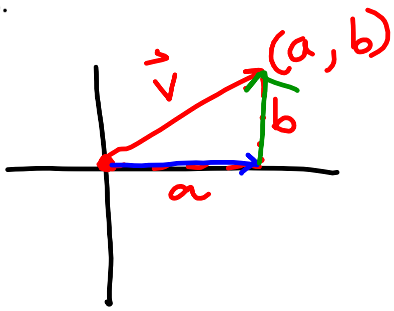
2nd period: Fri. 10/28 9am-11am

Bring your textbooks to class on the last day: Wed(2nd)/Thurs(1st)
It will be up to you to turn them in to the library.

Resolving a vector into horizontal and vertical components

32. $|\vec{u}| = 150$ lb, inclined upward to the right at $52°$ from the horizontal. Resolve $\vec{u}$ into horizontal and vertical components.





$\cos 52° = \dfrac{|\vec{x}|}{150 \text{ lb}}$

$|\vec{x}| = 150 \cos 52°$

$|\vec{x}| \approx 92.3$ lb

$\sin 52° = \dfrac{|\vec{y}|}{150 \text{ lb}}$

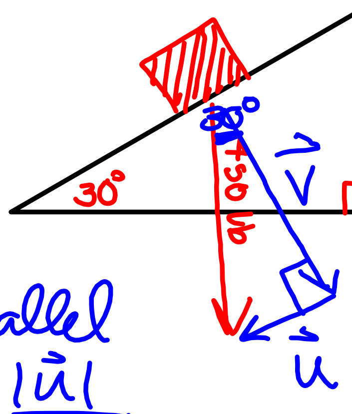
$|\vec{y}| = 150 \sin 52°$

$|\vec{y}| \approx 118.2$ lb

The object on a ramp problem

40. If a 450~~kg~~lb object is at rest on a ramp with a 30° incline, find the components of the force of the object's weight parallel and perpendicular to the ramp.

* weight always points straight down



$\vec{v}$ = perpendicular (normal)

$\cos 30° = \frac{|\vec{v}|}{450}$

$|\vec{v}| = 450\cos 30°$

$= 450 \cdot \frac{\sqrt{3}}{2}$

$= 225\sqrt{3}$ lb

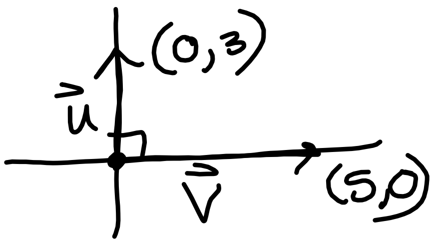
$\vec{u}$ = parallel

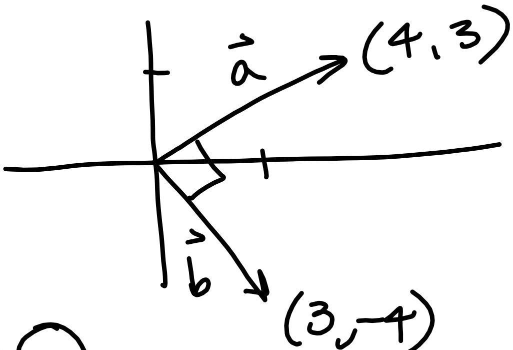
$\sin 30° = \frac{|\vec{u}|}{450}$

$|\vec{u}| = 450\sin 30°$

$= 450(1/2)$

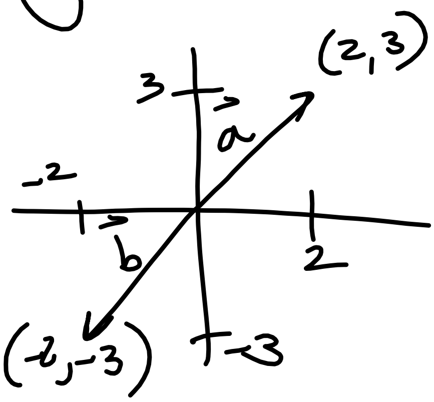
$= 225$ lb





$\vec{u} \cdot \vec{v} = 0 \cdot 5 + 0 \cdot 3 = 0$

$\vec{a} \cdot \vec{b} = 4(3) + 3(-4) = 0$



Solve for x. (all solutions, no restrictions)

$\sin 2x - \sin x = 0$

$2\sin x\cos x - \sin x = 0$

$\sin x(2\cos x - 1) = 0$

$\sin x = 0$, $2\cos x - 1 = 0$

$\begin{cases} x = 0 + 2\pi k \\ x = \pi + 2\pi k \end{cases}$ $2\cos x = 1$

$\cos x = \frac{1}{2}$

$x = \pi k$ $x = \frac{\pi}{3} + 2\pi k$

$x = \frac{5\pi}{3} + 2\pi k$

Given $\vec{v} = \langle -1,6 \rangle$, $\vec{w} = \langle 6,-1 \rangle$

1. Find $2\vec{v} - 3\vec{w}$. $2\langle -1,6\rangle - 3\langle 6,-1\rangle = \langle -2,12\rangle - \langle 18,-3\rangle$
$= \langle -20, 15\rangle$

2. Find $|\vec{v}|$. $\sqrt{(-1)^2+6^2} = \sqrt{37}$

3. Find $|\vec{w}|$. $\sqrt{(6)^2+(-1)^2} = \sqrt{37}$

4. Find $\vec{v} \cdot \vec{w}$.
$(-1)(6) + 6(-1) = -12$

~~5. Find the angle θ between $\vec{v}$ and $\vec{w}$.~~

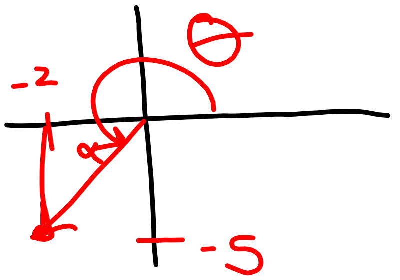
6. Find a unit vector $\vec{u}$ in the same direction as $\vec{v}$. $\left\langle \frac{-1}{\sqrt{37}}, \frac{6}{\sqrt{37}} \right\rangle = \left\langle \frac{-\sqrt{37}}{37}, \frac{6\sqrt{37}}{37} \right\rangle$

Find a unit vector in the same direction as the given vector.

$\vec{r} = \langle -2, -8 \rangle$

Determine the direction angle of the given vector.

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



$$\alpha = \tan^{-1}\left|\frac{b}{a}\right|$$

$$= \tan^{-1}\frac{5}{2}$$

$$= 68.2^\circ$$

$$\theta = 180^\circ + 68.2^\circ$$

$$= \boxed{248.2^\circ}$$

Evaluate the inverse functions. Give your answers in radians.

1. $\csc^{-1}\left(-\frac{2}{\sqrt{3}}\right) = \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) = \boxed{-\frac{\pi}{3}}$

2. $\cot^{-1}\left(\frac{\sqrt{3}}{1}\right) = \boxed{\frac{\pi}{6}}$

Evaluate.

1. $\sin^{-1}\left(\sin\frac{\pi}{5}\right) = \frac{\pi}{5}$

2. $\tan^{-1}\left(\tan\frac{2\pi}{3}\right) = -\frac{\pi}{3}$

Given that $\tan\frac{x}{2} = \frac{1-\cos x}{\sin x}$, evaluate $\tan\frac{5\pi}{12}$.

$$\tan\frac{5\pi}{12} = \tan\frac{5\pi/6}{2} = \frac{1-\cos\frac{5\pi}{6}}{\sin\frac{5\pi}{6}}$$

$$= \frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{\frac{1}{2}}$$

$$= \left(1+\frac{\sqrt{3}}{2}\right)\cdot\frac{2}{1}$$

$$= \boxed{2+\sqrt{3}}$$

Prove.

$\sin 3x = 3\sin x - 4\sin^3 x$

$LHS = \sin 3x = \sin(2x+x) =$

$= \underline{\sin 2x}\cos x + \cos 2x \sin x$

$= \underline{2\sin x\cos x}\cos x + (\cos^2 x - \sin^2 x)\sin x$

$= 2\sin x\cos^2 x + \sin x\cos^2 x - \sin^3 x$

$= 3\sin x\underline{\cos^2 x} - \sin^3 x$

$= 3\sin x(1-\sin^2 x) - \sin^3 x$

$= 3\sin x - 3\sin^3 x - \sin^3 x$

$= 3\sin x - 4\sin^3 x$

$= RHS$ ✓