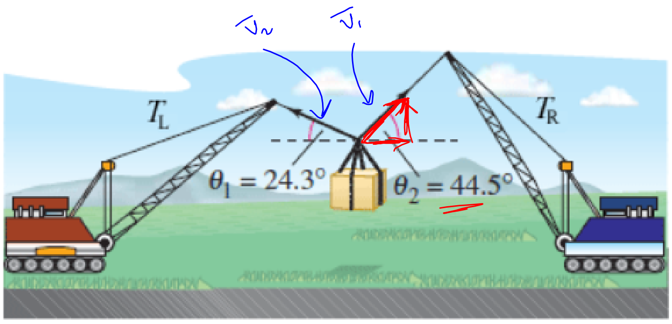
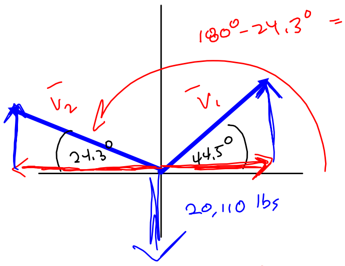


$\sqrt{\cos^2\theta + \sin^2\theta}$

$180° - 24.3° = 155.7°$



$\vec{v}_1 = \|\vec{v}_1\| \langle \cos 44.5°, \sin 44.5° \rangle$

$\vec{v}_2 = \|\vec{v}_2\| \langle \cos 155.7°, \sin 155.7° \rangle$

$\|\vec{v}_1\| \cos 44.5° + \|\vec{v}_2\| \cos 155.7° = 0$

$\|\vec{v}_1\| \sin 44.5° + \|\vec{v}_2\| \sin 155.7° = 20110$

$\cos 44.5° = a$
$\sin 44.5° = b$
$\cos 155.7° = c$
$\sin 155.7° = d$

$\|\vec{v}_1\| a + \|\vec{v}_2\| c = 0$
$\|\vec{v}_1\| b + \|\vec{v}_2\| d = 20110$

$a\|\vec{v}_1\| + c\|\vec{v}_2\| = 0$

$\Rightarrow a\|\vec{v}_1\| = -c\|\vec{v}_2\|$

$\|\vec{v}_1\| = -\frac{c}{a}\|\vec{v}_2\|$

Plug it into 2nd eq'n

$b\|\vec{v}_1\| + d\|\vec{v}_2\|$

$= b\left(-\frac{c}{a}\|\vec{v}_2\|\right) + d\|\vec{v}_2\|$

```
-sin(44.5)*cos(1
55.7)/cos(44.5))
          50627.13306
-cos(155.7)/cos(
44.5)*Ans
          64692.19194
█
```

$= \|\vec{v}_2\| = \|\vec{v}_2\|\left[-\frac{bc}{a} + d\right] = 20110$

$= \|\vec{v}_1\| \Rightarrow \|\vec{v}_2\| = \frac{20110}{d - \frac{bc}{a}} = \frac{20110}{\sin 155.7 - \frac{(\sin 44.5)(\cos 155.7)}{\cos 44.5°}}$

$\|\vec{v}_1\| \cos 44.5° + \|\vec{v}_2\| \cos 155.7° = 0$

$\|\vec{v}_1\| \sin 44.5° + \|\vec{v}_2\| \sin 155.7° = 20110$

$(64692.19194)\cos(44.5°) + (50627.13306)\cos(155.7°) \approx 3 \times 10^{-6} \approx 0$

$(64692.19194)\sin(44.5°) + (50627.13306)\sin(155.7°)$

$\vec{v}_1 = \langle \|\vec{v}_1\| \cos 44.5°, \|\vec{v}_1\| \sin 44.5° \rangle$

$a\langle b, c\rangle = \langle ab, ac\rangle$ scalar times vector

$3\langle 2,1\rangle = \langle 6,3\rangle = \langle 3 \cdot 2, 3 \cdot 1\rangle = 3\langle 2,1\rangle$

```
627.13306*cos(15
5.7)
          3.296E-6
64692.19194*sin(
44.5)+50627.1330
6*sin(155.7)
          66177.14885
█
```

≈ 0 so 1st eq'n is happy!

should be 20,110

$\|\vec{v}_1\| \sin 44.5° + \|\vec{v}_2\| \sin 155.7°$ SHOULD $=$ 20,110

20,110

Test 3 Monday, November 2nd

Covers Chapter 3 and Everything Before.

My Number:

970-290-0550

Let $x = \|\bar{v}_1\|$, $y = \|\bar{v}_2\|$

The horizontal forces are balanced (Equal and opposite)

$$x \cdot \overset{a}{\cos(44.5^\circ)} + y \cdot \overset{b}{\cos(155.7^\circ)} = 0$$

The vertical force is 20,110 lb

$$x \cdot \overset{c}{\sin(44.5^\circ)} + y \cdot \overset{d}{\sin(155.7^\circ)} = 20110$$

$$ax + by = 0$$
$$cx + dy = 20110$$

$$\left[\begin{array}{cc|c} a & b & 0 \\ c & d & 20110 \end{array}\right]$$

$ax + by = 0$

$ax = -by$

$x = -\frac{b}{a}y$ Send this to $cx + dy = 20110$

$$c\left(-\frac{b}{a}y\right) + dy = 20110$$

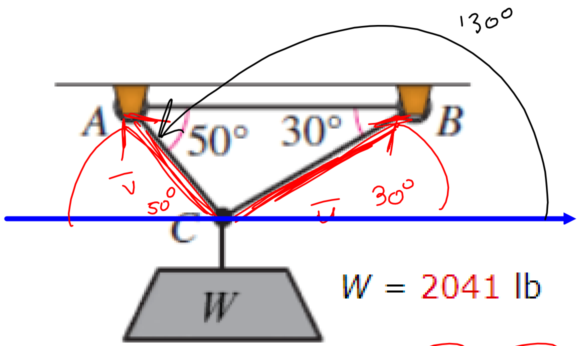
$$-\frac{bc}{a}y + dy = 20110$$

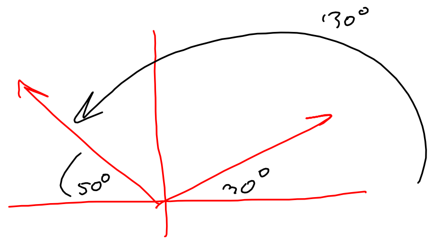
$$y\left(-\frac{bc}{a} + d\right) = 20110$$

$$y = \frac{20110}{d - \frac{bc}{a}}$$

```
cos(44.5)
        1.307147864
20110/Ans
        15384.64052
-cos(155.7)/cos(
44.5)*Ans
        19658.74932
```

$$y = \|\bar{v}_2\| = \frac{20110}{\sin(155.7^\circ) - \frac{\cos(155.7^\circ)\sin(44.5^\circ)}{\cos(44.5^\circ)}}$$

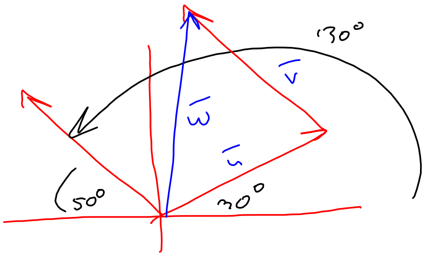




$\bar{v} = \langle \|\bar{v}\| \cos(130^\circ), \|\bar{v}\| \sin(130^\circ) \rangle$ vertical components

$\bar{u} = \langle \|\bar{u}\| \cos(30^\circ), \|\bar{u}\| \sin(30^\circ) \rangle$

horizontal components



$\bar{w} = \bar{u} + \bar{v}$ = Resultant

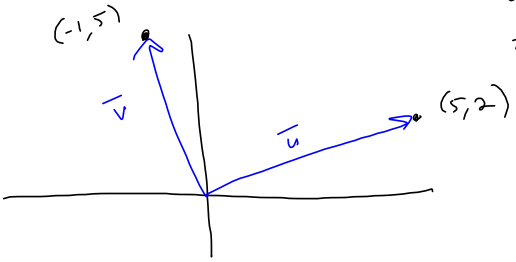
§3.4 – DOT PRODUCT

Vector $\bar{u}, \bar{v}$

$\bar{u} = \langle 5,2 \rangle$

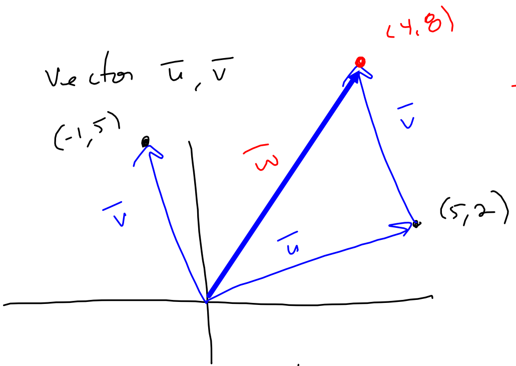
$\bar{v} = \langle -1,5 \rangle$

Put a bar over vectors, to distinguish them from scalars, like 5.



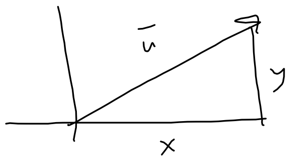
Adding vectors: $\bar{u} + \bar{v} = \langle 5,2 \rangle + \langle -1,6 \rangle$
$= \langle 5-1, 2+6 \rangle = \langle 4,8$

Vector $\bar{u}, \bar{v}$



$\bar{w} = \bar{u} + \bar{v} = \langle 4,8 \rangle$

Magnitude of a vector: $\bar{u} = \langle x,y \rangle$



$\|\bar{u}\| = \sqrt{x^2+y^2}$

3.4 DOT PRODUCT:

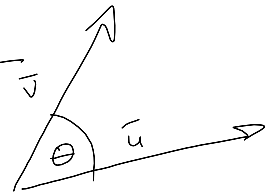
$\bar{u}\cdot\bar{v} = \langle u_1,u_2\rangle \cdot \langle v_1,v_2\rangle = u_1v_1 + u_2v_2$

$\bar{u} = \langle 1,2\rangle$, $\bar{v} = \langle -5,6\rangle \Rightarrow$

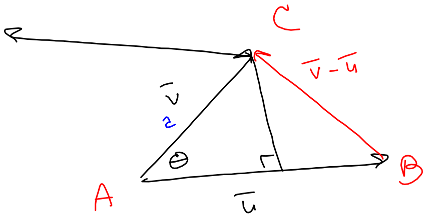
$\bar{u}\cdot\bar{v} = (1)(-5)+(2)(6) = -5+12 = \boxed{7 = \bar{u}\cdot\bar{v}}$

Perpendicular Vectors $\bar{u}, \bar{v}, \Rightarrow$

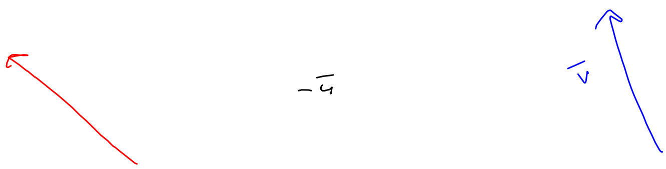
$\bar{u} \perp \bar{v} \iff \bar{u}\cdot\bar{v} = 0$

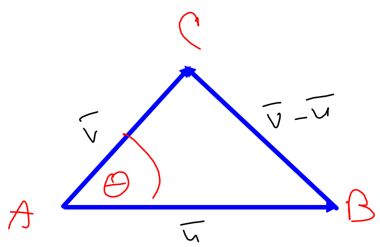


$$\cos\theta = \frac{\bar{u}\cdot\bar{v}}{\|\bar{u}\|\|\bar{v}\|}$$



Recall





Law of Cosines

$a^2 = b^2+c^2-2bc\cos\theta$

$\|\bar{v}-\bar{u}\|^2 = \|\bar{v}\|^2+\|\bar{u}\|^2 - 2\|\bar{u}\|\|\bar{v}\|\cos\theta$

$\left(\sqrt{(v_1-u_1)^2+(v_2-u_2)^2}\right)^2 = \|\bar{v}\|^2+\|\bar{u}\|^2-2\|\bar{u}\|\|\bar{v}\|\cos\theta$

$(v_1-u_1)^2 = v_1^2 - 2u_1v_1 + u_1^2 + v_2^2 - 2u_2v_2 + u_2^2$

$= v_1^2+v_2^2+u_1^2+u_2^2 - 2(u_1v_1+u_2v_2)$

$\boxed{\|\bar{v}\|^2 + \|\bar{u}\|^2} - 2\,\bar{u}\cdot\bar{v} = \boxed{\|\bar{u}\|^2+\|\bar{v}\|^2} - 2\|\bar{u}\|\|\bar{v}\|\cos\theta$

$\cancel{2}\|\bar{u}\|\|\bar{v}\|\cos\theta = \cancel{2}\,\bar{u}\cdot\bar{v}$

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