11/19/2012 - Sec 5.5

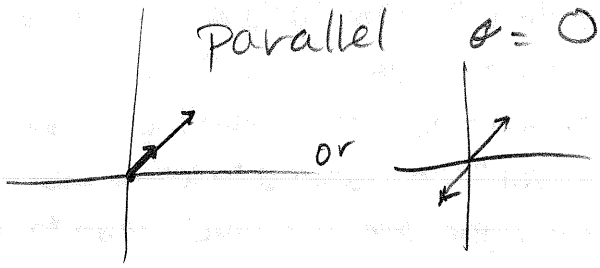
Math 1060

#58

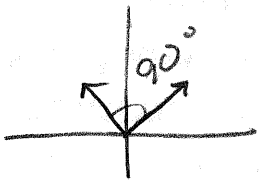
$\langle 2, 6 \rangle$, $\langle 6, 2 \rangle$

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

Parallel $\theta = 0$, or $180°$



Perpendicular



Neither

any Not 0, 90, 180

$\vec{u} \cdot \vec{v} = 2(6) + 6(2)$

$= 12 + 12$

$= 24$

$|\vec{u}| = \sqrt{2^2 + 6^2}$

$= \sqrt{4 + 36}$

$= \sqrt{40}$

$= 2\sqrt{10}$

40, 20, 10, 2, 2, 5

$|\vec{v}| = \sqrt{6^2 + 2^2}$

$= \sqrt{36 + 4}$

$= \sqrt{40}$

$= 2\sqrt{10}$

$$\cos\theta = \frac{24}{2\sqrt{10} \cdot 2\sqrt{10}}$$

$$\cos\theta = \frac{24^{3}}{40_{5}}$$

$\cos\theta = 3/5$

Not of 0, 90, or 180

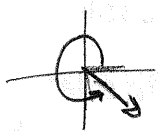
Neither

$\vec{A} = \langle 3, 1 \rangle \qquad \vec{B} = \langle -2, 3 \rangle$

$\frac{1}{2}\vec{A} - 2\vec{B} = \frac{1}{2}\langle 3, 1 \rangle + -2\langle -2, 3 \rangle$

$= \langle \frac{3}{2}, \frac{1}{2} \rangle + \langle 4, -6 \rangle$

$= \langle \frac{11}{2}, -\frac{11}{2} \rangle$



$\left| \langle \frac{11}{2}, -\frac{11}{2} \rangle \right| = \sqrt{\left(\frac{11}{2}\right)^2 + \left(-\frac{11}{2}\right)^2}$

$= \sqrt{\frac{121}{4} + \frac{121}{4}}$

$= \sqrt{\frac{242}{4}}$

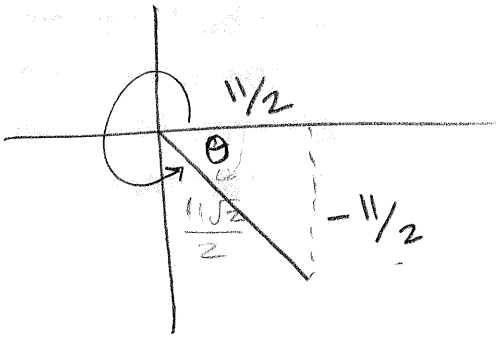
$= \frac{\sqrt{242}}{\sqrt{4}}$

$= \frac{11\sqrt{2}}{2} \approx 7.8$

242

$121 \quad 2$

$11 \quad 11$



Magnitude = 7.8

direction angle = 315°

$\tan\theta = \frac{-11/2}{11/2}$

$\tan\theta = -1$

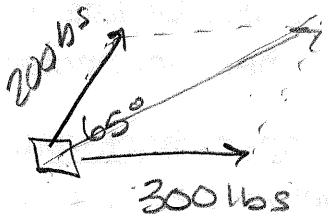
$\theta = -45$

$360 - 45 = 315°$

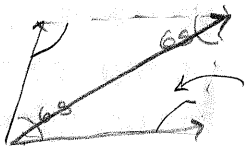
Sec 5.5 Applications of Vectors

"Basic" Resultant Problem

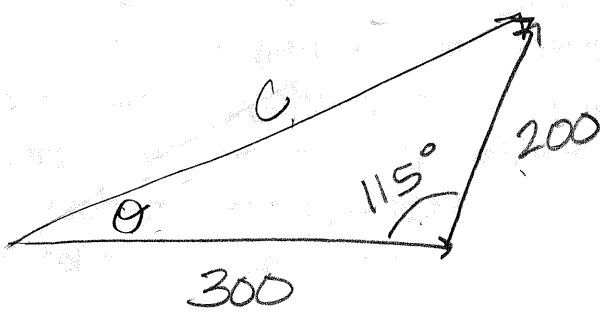
two forces acting on an object modeled by Vectors



want to know the magnitude of the Resultant force



$180 - 65 = 115°$



$$C^2 = 300^2 + 200^2 - 2(300)(200)\cos 115°$$

$$C^2 = 180714.1914$$

$$C = 425.1 \text{ lbs}$$

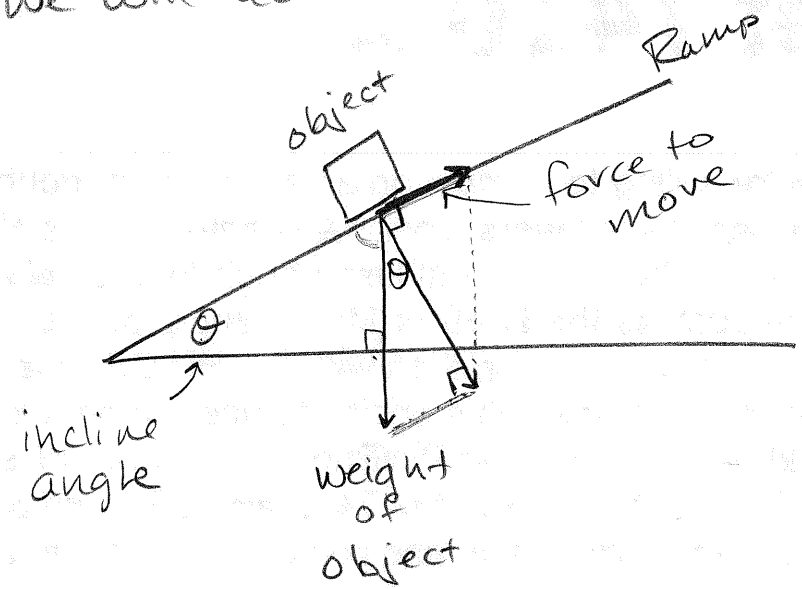
What angle between Resultant & 300lb horse?

$$\frac{\sin\theta}{200} = \frac{\sin 115}{425.1\ldots}$$

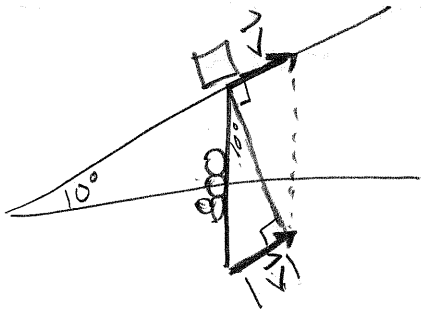
$$\theta = 25.2°$$

Inclined Plane Problem

We will assume NO friction



How much force is Required to push an 800-lb block of ice up a Ramp inclined 10°



$$800 \sin 10° = \frac{|\vec{v}|}{800} \cdot 800$$

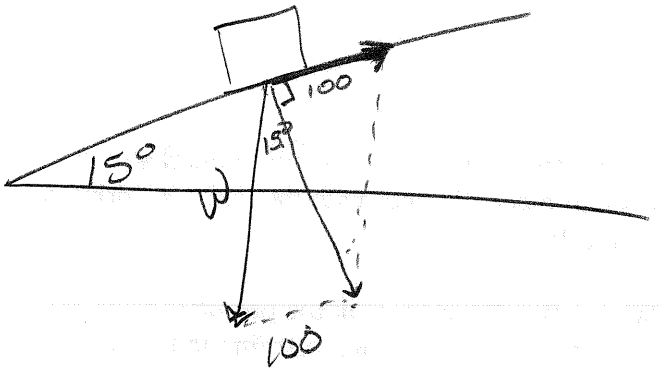
Force Required

$800 \sin 10° = 138.9$ lb

Problem #2

Landscaper uses 100 pounds of force to pull a cart full of Rocks up a driveway that is inclined 15°. What is the weight of the cart

Ans: ~~25.9 lbs~~, 386.4 lbs



$\sin 15 = \frac{100}{W}$

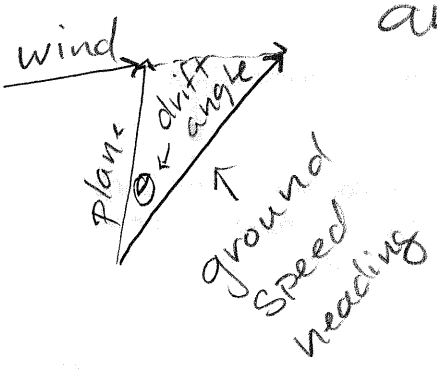
$\frac{W \sin 15}{\sin 15} = \frac{100}{\sin 15}$

$W = \frac{100}{\sin 15}$

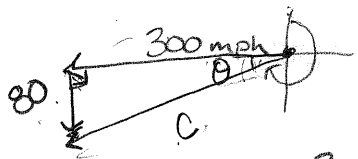
$W = 386.4 \text{ lbs}$

Navigation Problems

for a plane: Air speed and heading is affected by wind's speed and heading



#16



$C^2 = 80^2 + 300^2$

$C^2 =$

$C = 310.5 \text{ mph}$

$\sin\theta = \frac{80}{310.5}$

$\theta = 14.9°$

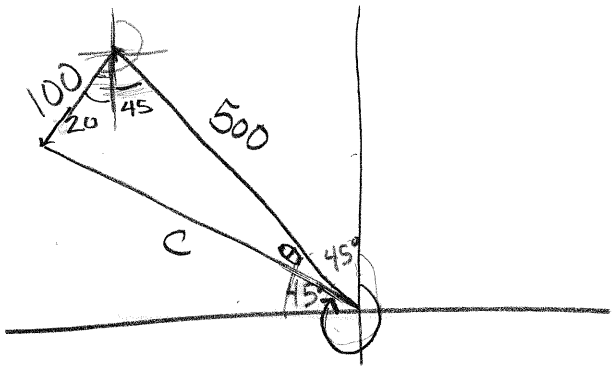
$270 - 14.9$

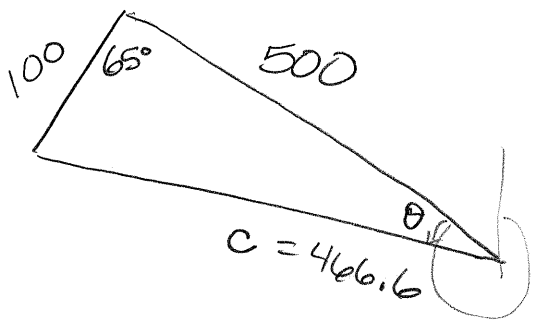
Bearing: $255.1°$ or W $14.9°$ S

Jet headed NW airspeed of 500mph

Wind is 100 mph w/bearing 200°

Find Drift angle, Ground speed, course of Jet (aka Bearing)





$C^2 = 100^2 + 500^2 - 2(100)(500)\cos 65°$

$C^2 =$

$C = 466.6$ mph

Law of Sines to find θ

$\theta = 11.2°$

Bearing $= 315 - 11.2 = 303.8°$