1 Welcome to Lin. Alg.

Used in all science / tech / math fields

useful tools

often turn a problem into a lin. alg. question to use the tools.

Central ideas

Linear Relationships

Systems.

↙ Transformation ✶

how to characterize a lin. transformation?

how to Represent a lin. transformation?

calculations associated w/ a trans.

which lin tras?

decompose?

② Systems

Everywhere! — "things" interact

multiple forces
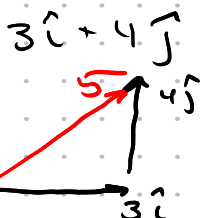
circuits

chemical reaction

diff. species of animals

:

③ Represent a vector

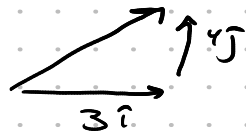Eng: 5N at an angle of 53.1° from horizontal

Magnitude & dir.

Scalar 3 in the $\hat{i}$ dir. plus 4 in the j dir.

$3\hat{i} + 4\hat{j}$

components.

math

$$\begin{bmatrix} 3 \\ 4 \end{bmatrix} = 3\hat{\imath} + 4\hat{\jmath} = 5 \text{ at a angle of } 53.1°$$
fm horizntl.

column vectr.
it is all the same!

In this course:

— Linear Systems —   vectors — planes —   Related!

matrix Representd.   Row operat.
operation   RREF
inverse   Lin comb.
decompositn.   lin. ind.
⋮   ⋮
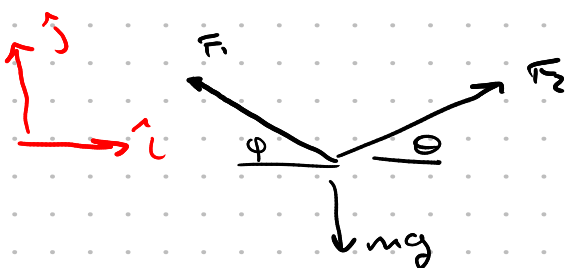
et/   Box held up w/ two ropes.
      givn the angles ϕ, θ & weight
      what are the tensions
      in the ropes?

— assume static.
  sum of force $= \vec{0}$.

— Break into component
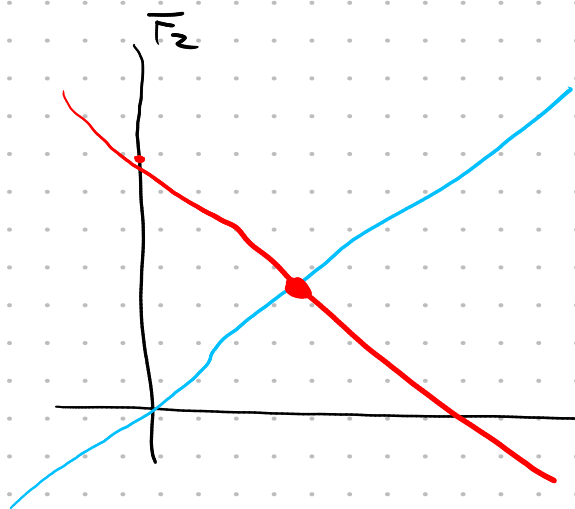 up/down-   left/right
  each comp. is zero.

— movie —

Another way to look @ it

left/right
$-F_1 \cos \phi + F_2 \cos(\theta) = 0$

$F_1 \sin \phi + F_2 \sin \theta - mg = 0$

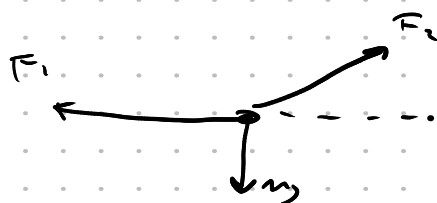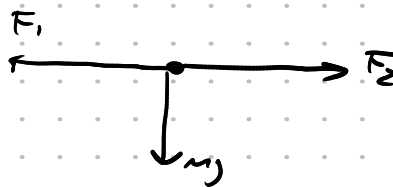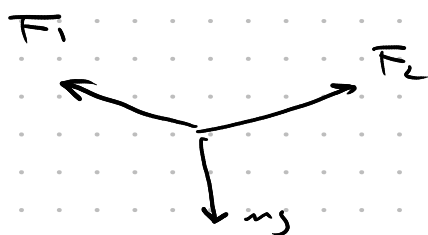so $F_2 \underline{\cos(\theta)} = F_1 \underline{\cos(\phi)}$ Known

Linear Relatnship!

$$F_2 = F_1 \cdot \frac{\cos \varphi}{\cos \theta}$$

$$F_1 \sin(\varphi) + F_2 \sin(\theta) = mg$$

Q1 what happen for differt angles?

what can we say in colum
about when a soln exists
on if it is unique?

if $F_1 + F_2 = mg$

1 eq. 2 unknws