Homework 5.

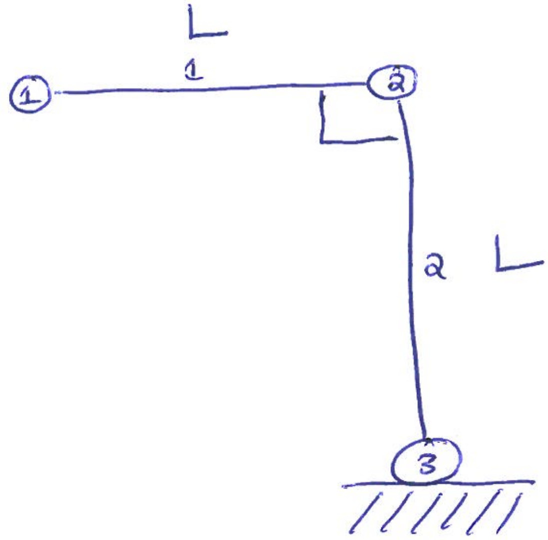
Trusses.

Section 2.7

All genuine attempts get full credit.

Question 1

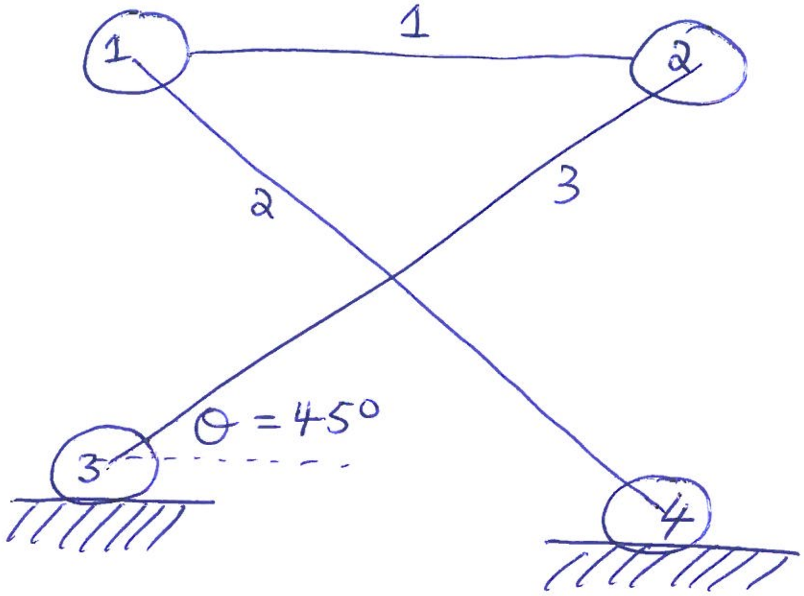
Consider the truss:



What is the simplest change you can think of to make the truss stable?

Draw a nice picture of your new, stable truss.

Question 2

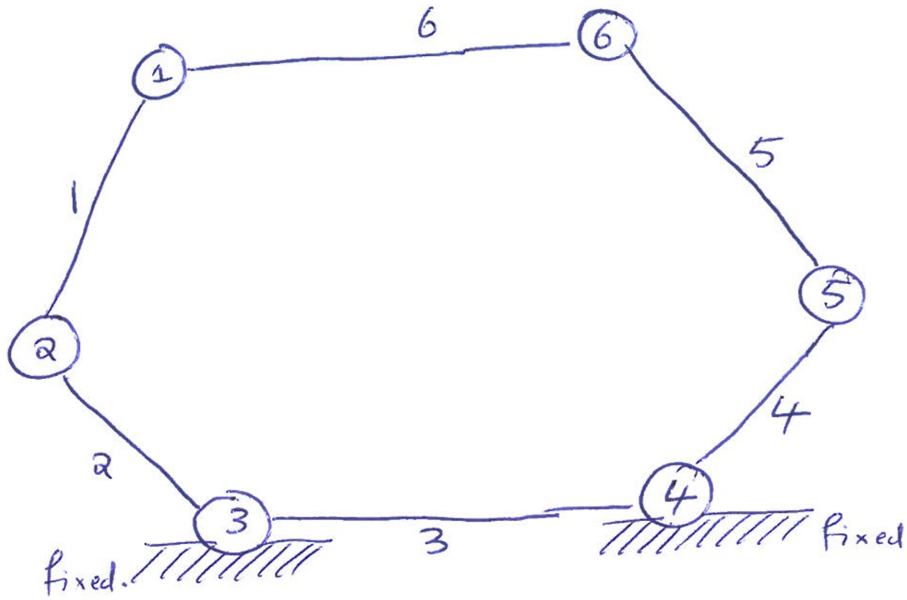


What is the simplest change you can think of to make the truss stable?

Draw a <u>nice picture</u> of your new, stable truss.

Question 3: (See Professor Strang on Open Course Ware, lecture 16, ~30min in)

Consider the truss:



6 bars (equal length), 6 nodes
equal angles

(a) What is the size of the matrix A?

m = no. rows = ________.

n = " cols = ________.

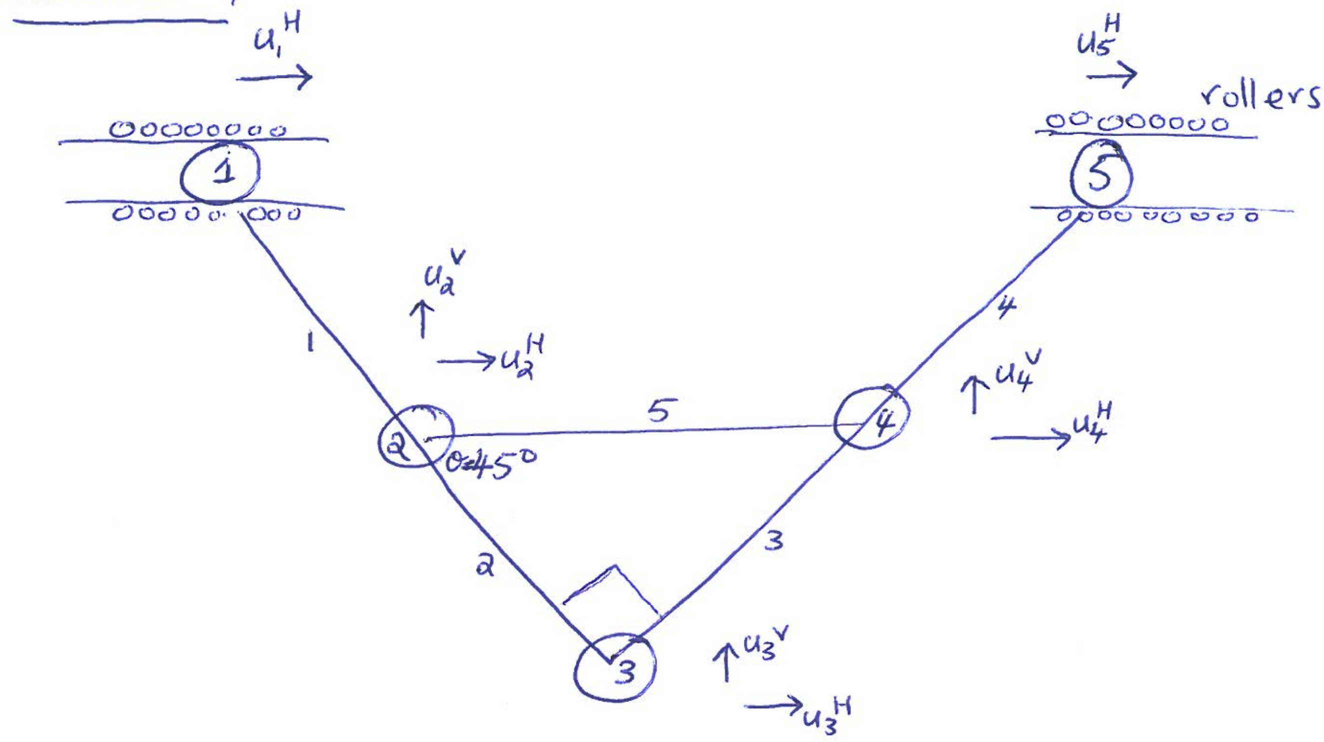
(b) Is the truss stable?

(c) If "no", how many independent mechanisms are there?
(Give a number, and an explanation.)

(d) Give a nice drawing of a complete set of independent mechanisms.

(e) Give a nice drawing of the new truss, after you have added the minimum number of bars to make it stable.

Question 4



5 bars, 2 roller supports, 5 nodes. (past exam question)

(a) What rigid motion is possible?

(b) As usual, let $u = [u_1^H, u_2^H, u_2^V, u_3^H, u_3^V, u_4^H, u_4^V, u_5^H]^T$ displacement of nodes

and $e = [e_1, e_2, e_3, e_4, e_5]^T$ be elongation of bars, and

let A be the matrix so that $e = Au$.

What vector u represents the rigid motion in (a)?

(c) Fix node 3. Is the truss now stable?

If "yes", explain why.

If "no", give at least one vector in the null space of the (new) A and draw a nice picture of the corresponding mechanism.

Also, if "no", draw another nice picture of the truss, after you have made the simplest change you can think of to make it stable.