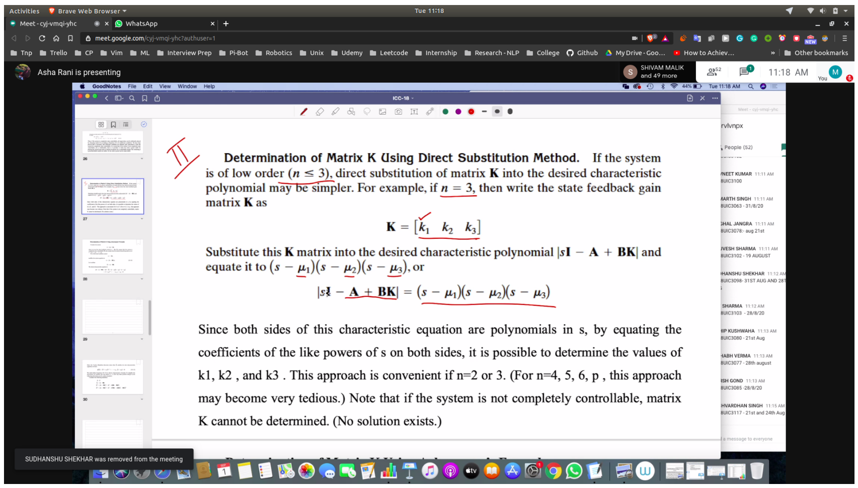
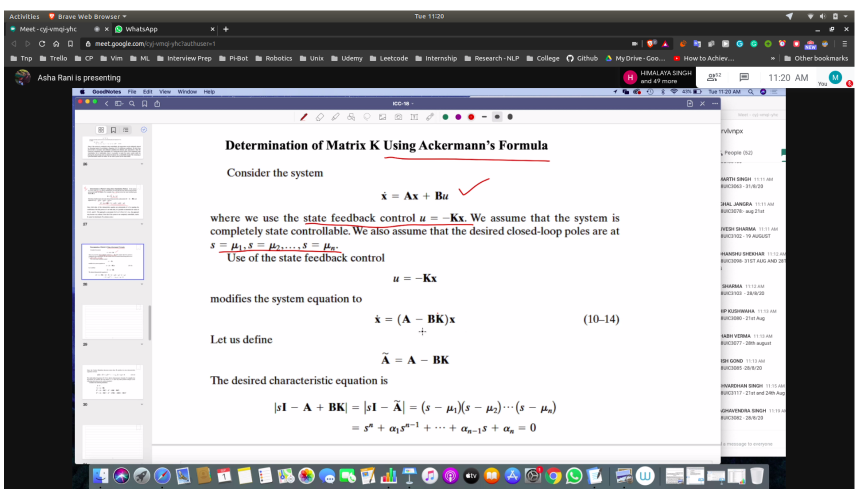
Notes

Determination of the k using direct substitution method

- 

Determination of K Using the Ackermann's Formula

- 

Deriving ackerman's formula

- We will prove this using the caley hamilton theorem
- every matrix A satisfies it's own characteristic equation

- First doing for the case of n = 3

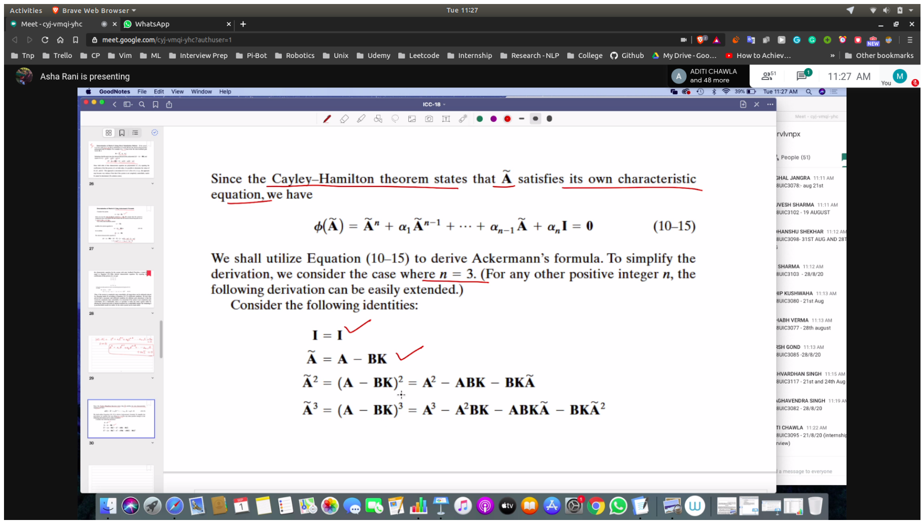
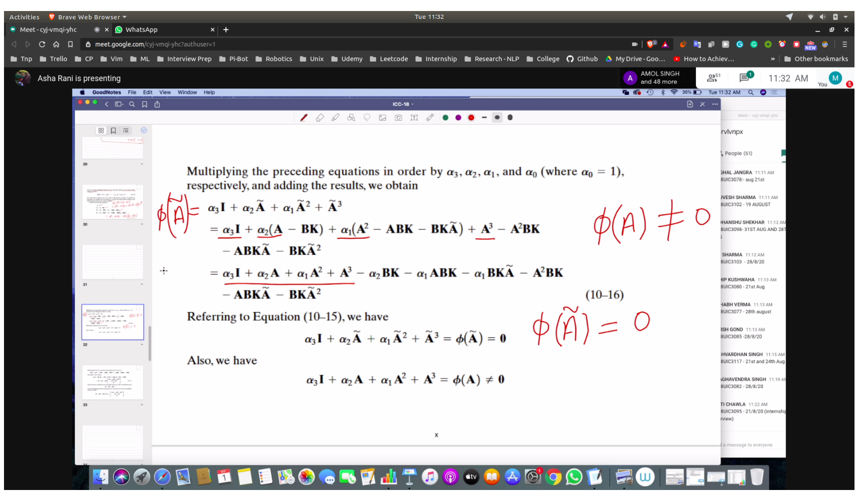


Figure 1: deriving_ackermann

-
- We make A~ for the dersired response
- and A will not satisfy the eqn.
- so phi(A~) = 0 , else phi(A)!=0



-
- making both the equation equal for desired and actual
-

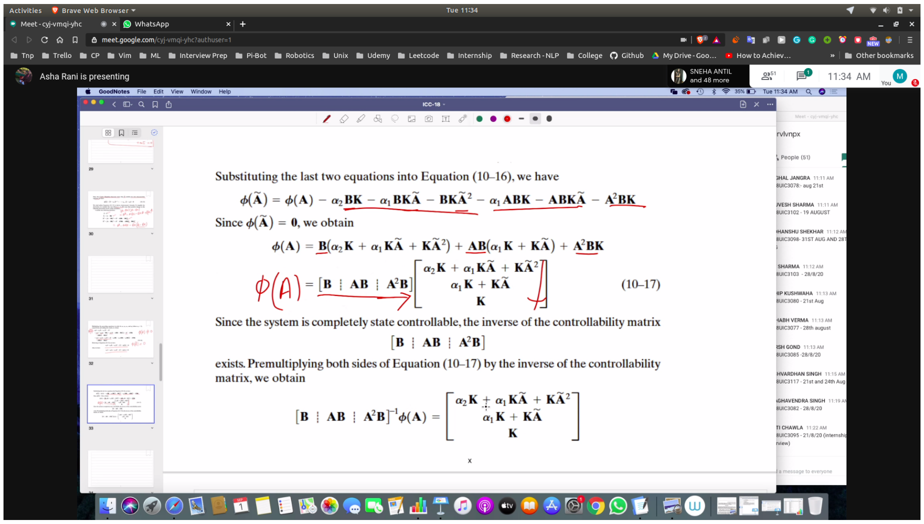
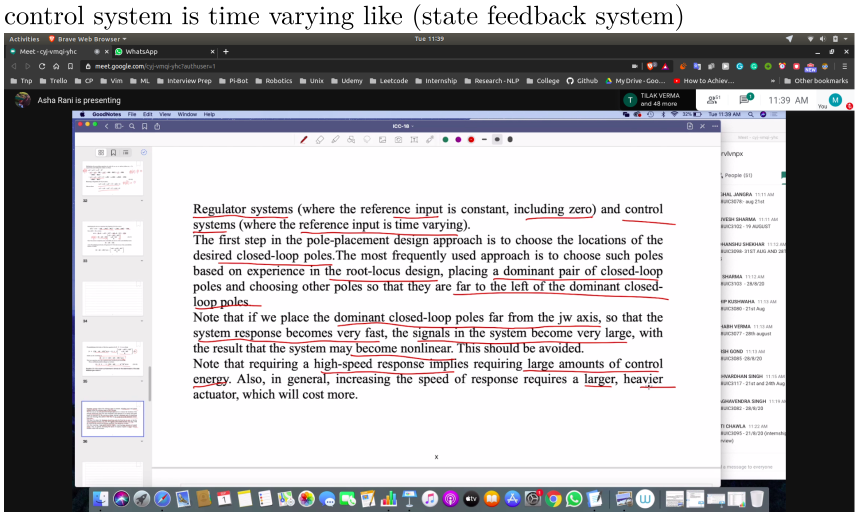


Figure 2: derive_ackermann3

- obtaining K (state feedback gain matrix)
-

Regulator System

- reference input is constant
- control system is time varying like (state feedback system)
- 

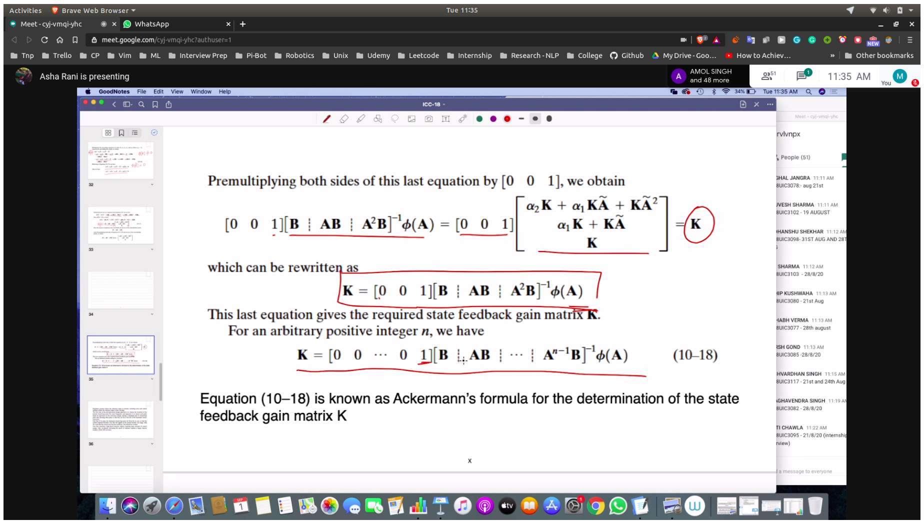
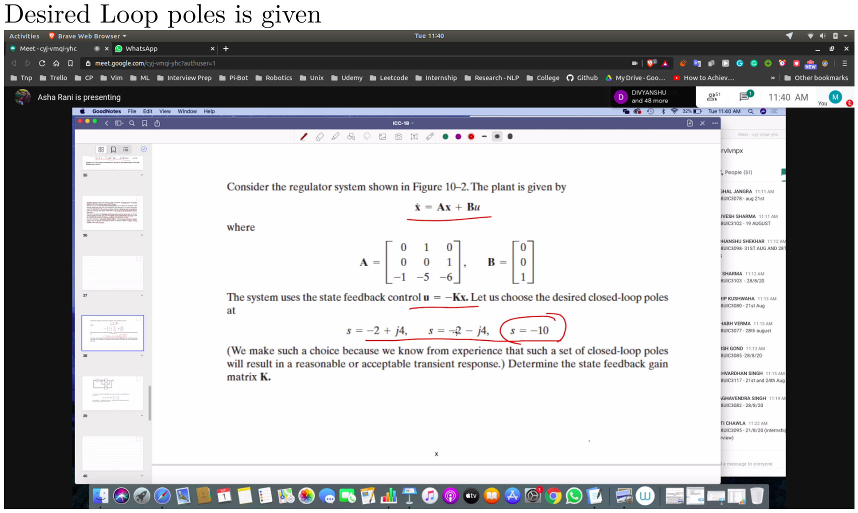


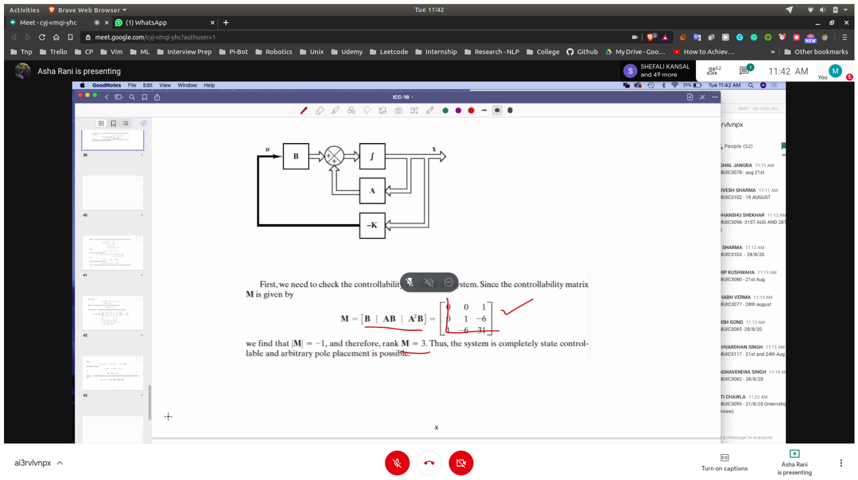
Figure 3: obtain_k

Doing Problem

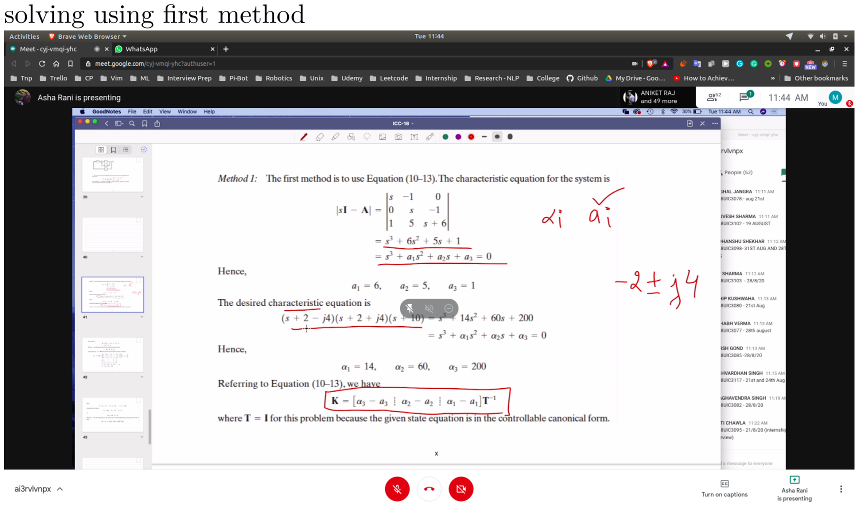
- We have the state variable equation
- Desired Loop poles is given



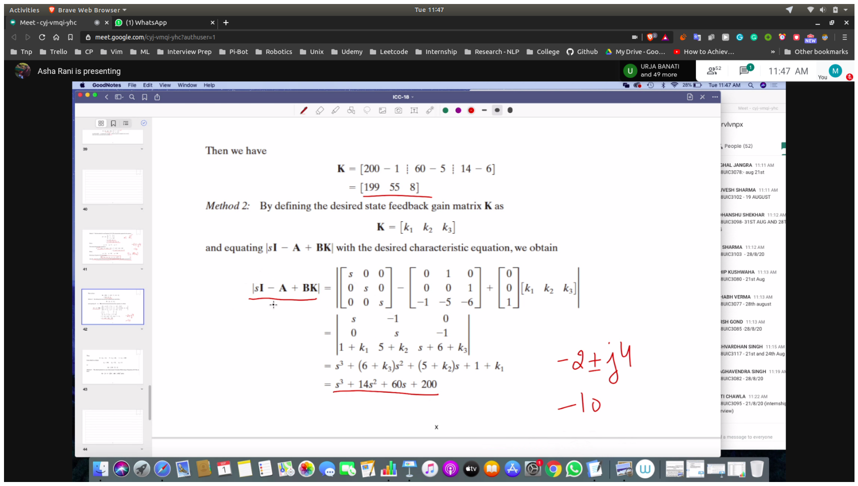
- First we check controllability using AB in the state equation

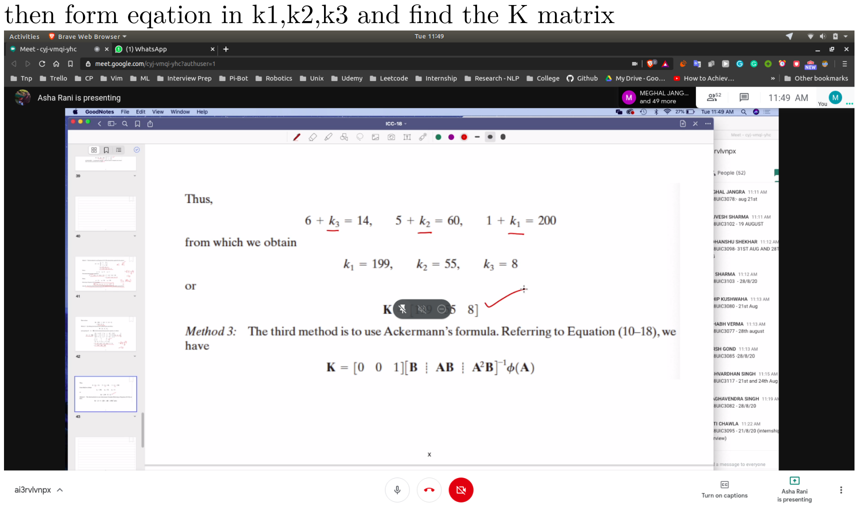


-
- solving using first method

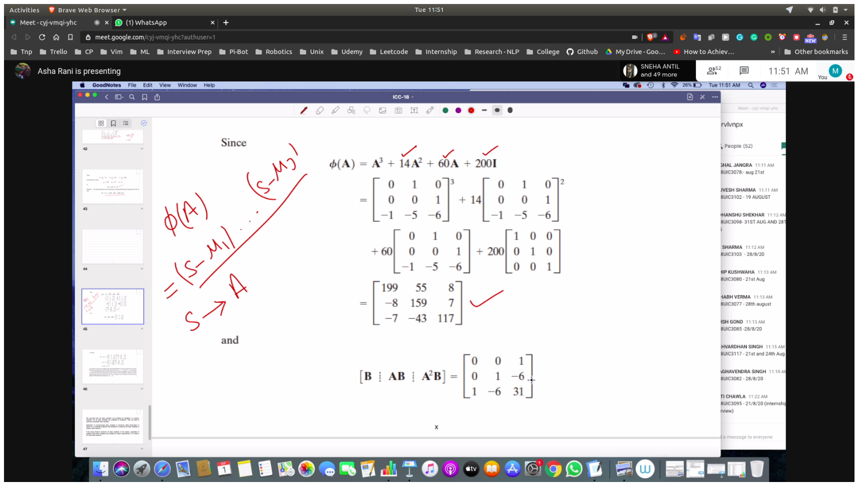


-
- obtained K
- solving using second method

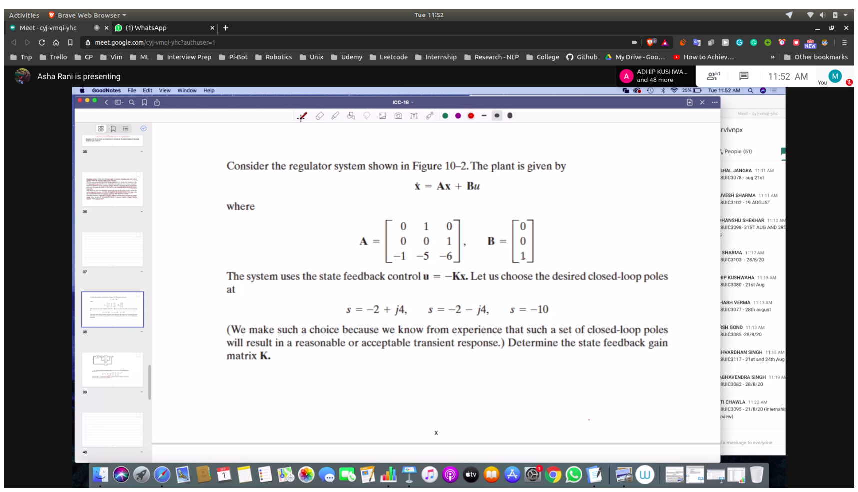
- 

- so we put k1, k2 ,k3
- then put it equal to the desired quation
- then form eqation in k1,k2,k3 and find the K matrix
- 

- Third method
- find char eqn
- put A in that , and obtain phi(A)

- 
Asha Rani is presenting
Since
φ(A) = A³ + 14A² + 60A + 200I
= [0 1 0; 0 0 1; −1 −5 −6]³ + 14 [0 1 0; 0 0 1; −1 −5 −6]²
+ 60 [0 1 0; 0 0 1; −1 −5 −6] + 200 [1 0 0; 0 1 0; 0 0 1]
= [199 55 8; −8 159 7; −7 −43 117]
and
[B ⋮ AB ⋮ A²B] = [0 0 1; 0 1 −6; 1 −6 31]
φ(A) = (s−λ1) . . . (s−λn)
s → A

Homework

- 
Asha Rani is presenting
Consider the regulator system shown in Figure 10–2. The plant is given by
ẋ = Ax + Bu
where
A = [0 1 0; 0 0 1; −1 −5 −6], B = [0; 0; 1]
The system uses the state feedback control u = −Kx. Let us choose the desired closed-loop poles at
s = −2 + j4, s = −2 − j4, s = −10
(We make such a choice because we know from experience that such a set of closed-loop poles will result in a reasonable or acceptable transient response.) Determine the state feedback gain matrix K.