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OfficeHours_IS4_20160428_Seg03.pdf

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Setting:

Participants: S1 (male, blue button up shirt), IS4 (male, maroon shirt)

0:00

XXX S1: ok
XXX so let me just pull out the question,
XXX IS4: ((looks at paper)) it's (.) homework (.) six.
XXX ((whispers)) ok
XXX S1: (.3) yea
XXX IS4: ok
XXX S1: so:
XXX the first question is asking (.1) find a long term growth
XXX rate,
XXX IS4: yea the: long term growth (rate) is the dominant
XXX uh:
XXX (added value)
XXX S1: yea=
COM IS4: =yea
COM (.2) where is the (.1) ((incomprehensible))
COM ((S1 looking at laptop, IS4 looking at paper)) ((pause))
COM do- do you get
COM uh:
COM ((pause))
XXX S1: see I- I got to here
XXX I [can't find for lambda
XXX IS4: [oh
XXX S1: so
COM IS4: oh
COM yea yea yea
COM it is- I think ((incomprehensible)) (some numerical method)
COM because it is not (.)
COM I think it is not-
COM it's not- not easy to (.) to- to calculate this
COM (.2) to calculate this
COM uh
COM analytical(ly)
COM so (.2) uh:
COM I think that it's important. to (figure out) how to get
this
COM you can-
COM you can use any way to- to get this value°
COM like- like some numerical (approach)°

XXX S1: do you use a calculator?
XXX [but I can't use a calculator
XXX IS4: [yea (.) you can use calculator.
XXX S1: but I can't use a calculator during the test
XXX IS4: but
XXX I- I- I don't think th- this kind of problems will be:
XXX in the: examination
XXX because in- in- in the examination the answers will be:
XXX very easy,
XXX S1: ok
XXX IS4: the methods will be very easy.
XXX like the number will be like
XXX one or two
XXX or something else°
XXX S1: ok
XXX IS4: and it's- it's not possible to: (.)
XXX to have this kind of (.) values
XXX S1: so after you get the values
XXX [you just-
XXX IS4: [um
XXX you-
XXX uh: ((points at paper))
XXX the values is the ((incomprehensible))
XXX then you also need to::-
XXX S1: find [the (other value- eig- eigenvector)
XXX IS4: [find the:
XXX yea
XXX the (eigenvectors)
XXX yes
XXX and ((reads paper))
XXX S1: so how does that (.1) find the (eigenvector)
XXX I just plug it into [there,
XXX IS4: [um
XXX uh you (.) you plug it in the:
XXX in the equation
XXX ((suddenly looks around for something))
XXX uh: do you have scrap paper?°
XXX S1: ((looks around))
XXX yes
XXX ((pause as S1 looks for paper))
XXX IS4: ((looks down at paper))
XXX uh (.3) yea the (other) value is
XXX ((talks to self))
XXX 2 ((to self))
XXX so: you only need to solve this equation like (.)

XXX ((writing on paper))
XXX this l (.) l x equals (.) ((incomprehensible))
XXX (.1) this is what you need to solve
XXX S1: ok
XXX IS4: so: that- the l is ((writes on paper))
XXX is this:°
XXX ((pause))
XXX ((still writing on paper))
XXX x y z: (.) equals
XXX ((pause))
XXX ((solving problem on paper))
XXX so this is the (.)
XXX th- this is (.)
3:00
CLF the equation you (should solve)°
CLF ((looks at S1))
CLF and this x (y z) will: (.2)
CLF will form a: a (augmental).
XXX S1: form a what?
CLFIS4: uh
CLF an (augmental).°
CLF [this- this x y z is the (augmental)
XXX S1: [oh
CLF IS4: can- can you get it?
XXX S1: yes
XXX (.2) do I solve this by (.1)
XXX [um (placency)
XXX IS4: [solve this
XXX S1: I mean pivoting,
XXX or
XXX IS4: uh: I think
XXX (I think maybe use)° (.) Gaussian elimination
XXX Gaussian elimination° ((repeating))
XXX uh: (.1)
XXX yea
XXX (.3)((nods))
XXX uh for example in this one you ca:n
XXX ((writes on paper))
XXX you can get like
XXX this: if you multiply thi:s°,
XXX (.2) or: you can-
XXX d- do you have the textbook?
XXX S1: yes (.)
XXX it's online (.)
XXX because (.) some pages are cut off

XXX IS4: ((both looking at computer briefly))
XXX oh
XXX but but (.)
XXX but it's four point (.) fou- [four point five.
XXX S1: [oh four point five
XXX ok
XXX ((gets textbook and hands it to IS4))
XXX IS4: ((pause))
XXX ((flipping through text book))
XXX yea ((found page))
XXX just- just use: (.2) use this one
XXX ((pause due to looking at book))
XXX u- u- u- use this ((incomprehensible))
XXX uh: this equation is
XXX this equation is equi-
XXX is equivalent to m minus λ plus i : x (.) zero
XXX S1: ok
XXX IS4: m minus λ i
XXX you use thi:s, to:: (.)
XXX and multiply (.) a vector
XXX you will get a zero vector°
XXX S1: [alright
TTF IS4: [and the:
TTF and the solution to this problem is the (.1)
TTF is the (.1) (eigen:)vector
TTF and (.) in-
TTF in this context you will have
TTF like°
TTF ((pause))
TTF ((IS4 writing something down))
TTF so (.) this one (.3)
TTF equals to (.) zero
XXX this is what you get
XXX and you to- to solve this you can use (.2)
XXX Gaussian elimination (.) ok
XXX [I think-
XXX S1: [why,
XXX IS4: I think it's quite fa- familiar to you,
XXX S1: yes
XXX IS4: Gaussian elimination to: (to solve this°)
XXX uh:
XXX (.1) yea
XXX and you: you: you can get a-
XXX you can get a (.) (eigen) value.
XXX S1: where did you get these numbers from?

XXX ((pointing at sheet))
XXX zero minus (.) ((incomprehensible)) or
XXX IS4: hm?
XXX ((starts writing on paper))
XXX uh (.1) th- th- this number?
XXX S1: yea
XXX no this number ((points))
XXX IS4: oh (.) this number.
XXX th- this is the ei-
XXX this is the (eigenvalue^o.) (.3)
XXX ((looks at S1 for reaction))
XXX the (eigenvalue)
6:00
XXX you: get here ((points))
XXX S1: no but (.)
XXX it's negative
XXX IS4: oh because- because- because it is (.1)
XXX because it is (.2) ((flipping through book))
XXX 1 minus that part^o
XXX S1: ok
XXX IS4: so the:
XXX the vector,- the matrix will be like
XXX minus something minus something minus something^o
XXX and uh
XXX th-
XXX the (diagonal entrance) will be minus: number^o
XXX and all the:
XXX all the entrance will be the same as the (original^o)
XXX S1: ((slight nod))
XXX alright
XXX I think I got it
XXX IS4: yea (.) so:
XXX y- you need to solve this
XXX and uh y- you will get the (eigenvector)
XXX corresponding to (.) this
XXX (.3)((looks at S1))
XXX is it clear?
XXX S1: yes
XXX ((pause))
XXX ((looking at notes))
XXX and five point (.) one
XXX IS4: five point one^o
XXX ((pause))
XXX S1: alright let me pull it up^o
XXX ((pause))

XXX ((S1 looks through computer))
XXX number five
XXX part a,
XXX IS4: [yea
XXX S1: [which (file is)°-
XXX ((pause))
XXX ((both looking at computer screen))
XXX null space.
XXX IS4: oh null space°
XXX n-number five?
XXX S1: yes
XXX IS4: ((reading paper))
XXX oh
XXX five a b
XXX ((pause))
XXX ((both looking at screen))
XXX oh you- you- you should ((incomprehensible)) null space
XXX ok
XXX ((rearranges himself))
XXX uh: do you know what- what null space means?
XXX ((waits for S1 to respond)) (.)
XXX S1: [um
XXX IS4: [it means-
XXX S1: underdetermined system?
XXX IS4: yea they (.)
XXX the null space is all the solution that satisfies th- this
XXX equation°.
XXX to- to- to make the x equal zero.
XXX S1: a x ((to himself))
XXX IS4: all the solutions
XXX all the solutions of
XXX o- o- of this (.)
XXX all the vectors
XXX of this x y x two will be m::
XXX is the: m:
XXX ((pause))
XXX ((reading something on the computer))
XXX S1: so you did Gaussian elimination (.) for that↓ right?
XXX IS4: yea first you should do the Gaussian elimination
XXX you will find (.) one will cancel out
XXX right?
XXX S1: [mhm
XXX IS4: [it will be all zero.
XXX S1: yes=
XXX IS4: =so:

XXX so you'll find that this me-
XXX this equation (.1)
XXX this system is an overdetermined system.
XXX S1: yes
XXX IS4: yea and- and you- and
XXX the only- the only equation
XXX the only useful equation-
XXX S1: is the top one?
XXX IS4: yea
XXX this one°
XXX this one minus two°
XXX so
XXX in this case you can say
XXX if- if- if- if-
XXX if e- x two is one:
9:00
XXX and- and then x one is two:
XXX if x two is two:
XXX it'll be uh four
XXX right?
XXX S1: yes
XXX IS4: you can- you can set x two to be any of the nominals.
XXX and: x one is exactly two times (.)
XXX [of x two
XXX S1: [oh it's- (so that's what it is)
XXX IS4: so that's why (.1) uh
XXX that's why (.1)
XXX we will have a spa-
XXX a null space like (.) uh:
XXX >in this way<
XXX x times (.2) two one
XXX this is the: (.) (family)
XXX of- of the solutions
XXX (o:r with) .hhh
XXX or we call it (.) uh: null space=
XXX S1: =I thought it was one too because like
XXX isn't-
XXX if you plug in one for x one,
XXX [shouldn't-
XXX IS4: [you-
XXX yea i- i- i- if you plug x one to be one
XXX then x two is
XXX S1: four
XXX IS4: it's- it's one half
XXX S1: (.3) [oh yea it's one half

XXX IS4: (.3) [i- uh yea
XXX S1: [ok I got it backwards
TTF IS4: [if that's yea so- so it
TTF yea so it
TTF it- it- it's ((incomprehensible))°
TTF you um
TTF if if- if- if you get
TTF [if you get this one yea.
XXX S1: [((incomprehensible))
XXX IS4: (x times a) is- is equivalent to this (calculate)
XXX S1: yea yea I got it=
XXX IS4: =yea ok
XXX S1: I got it backwards
XXX ((pause))
XXX this is the same thing but (.1)
XXX for this one you ((trails off))
XXX IS4: for this one
XXX you also use Gaussian elimination,
XXX and you get
XXX ((incomprehensible)) matrix (.1)
XXX after Gaussian elimination (.1)
XXX do you get (.)
XXX [wait is it
XXX S1: [I'm not sure if that's right
XXX IS4: um (.2) ok so°
XXX ((pause, solving problem on paper))
XXX this is the: matrix (.2)
XXX and° (.2) ok°
XXX ((pause))
XXX ((writing something down))
XXX (two plus elimination)
XXX you will get (.2)
XXX zero:
XXX ((pause))
XXX ((writing))
XXX what, ((to himself))
XXX S1: hm,
XXX ((pause))
XXX ((IS4 still writing))
XXX oh ok (.2) yea
XXX mm yea
XXX that ((points at paper))
XXX that's it
XXX and uh:
XXX you will find (.) instead of- instead of this from two to

XXX one
XXX from two to one this will become from (.1)
XXX from three to two
XXX right,
XXX S1: (how do you see that?)
XXX IS4: because
XXX uh
XXX the original matrix give you three questions=
XXX S1: =right
XXX IS4: and now:
XXX one cuts out you will have (.) two equations
XXX ((holds up two fingers))
XXX right,
XXX S1: yes
XXX IS4: yea
XXX and it will become
XXX ((pause))
XXX ((IS4 writing))
XXX the basic idea is quite the same (.) with this one
XXX ((points at paper))
XXX and you will get
XXX $x^2 + 0$ (.) 0 ((writing))
XXX S1: mhm=
XXX IS4: =right,
XXX S1: 0 =
XXX IS4: =so
XXX you- you- you get-
XXX you will get this matrix
XXX x^2 is always equal to zero.
XXX S1: yes
XXX IS4: and (.) x^2 equals zero and this is fo:r
12:00
XXX ((incomprehensible)) minus x^2 plus two x
XXX so (.) x^2 (.) is zero
XXX so we can: remove this,=
XXX S1: =((incomprehensible))
XXX ok
XXX IS4: and (.) it will become four: ((writing)) (.2)
XXX right,
XXX S1: mhm
XXX IS4: and
XXX S1: so [we-
XXX IS4: [th- that's quite the same with th-
XXX if you switch x^3 with one
XXX it will be minus (.1) minus half,

XXX if x three is one
 XXX x one is minus half
 XXX right? (.2)
 XXX because four=
 XXX S1: =yes
 XXX IS4: because four x one plus=
 XXX S1: =mhm
 XXX IS4: yea
 XXX and
 XXX this will cause another family like (.3) like°
 XXX uh x one is always (.2) is always (.1) minus half of x
 XXX three°
 XXX right?
 XXX S1: mhm
 XXX IS4: and th- and- and (.1)
 XXX and this one's:
 XXX ((pause))
 XXX S1: oh (I think if you:) (.) this (.)
 XXX (I think) ((incomprehensible))
 XXX x one,
 XXX IS4: >yea yea yea<
 XXX if- if- if- if- if- x one is [one
 XXX S1: [if you solve
 XXX in terms of x one
 XXX like
 XXX four x one equals negative two x plus three (.1)
 XXX and you just divide it by four (.1)
 XXX IS4: ((nods))
 XXX S1: you get (.2)
 XXX x one equals negative two four x three
 XXX IS4: [m:
 XXX S1: [so you just (not) negative one half
 XXX ((pause))
 XXX but I still don't [know how-
 XXX IS4: [yea
 XXX S1: understand how you get this though
 XXX IS4: ho- (.) get this? ((points @ paper))
 XXX S1: yea=
 TTF IS4: =yea
 TTF uh:
 TTF this- this is because
 TTF mm
 TTF thi- (.1)
 TTF you see this is equivalent to be anyth-
 TTF any- any vector like

TTF x one: (.1) if you set uh:
TTF ((pause))
TTF ((IS4 writing something down))
TTF but f- from this equation we get x one equals-
TTF oh x three equals (.) minus two x one°
TTF right,
XXX S1: mhm
XXX IS4: so° (.)
XXX no
XXX the: (.)
XXX oh the solution's x one
XXX x two x three can be
XXX (if pressing terms reflect this°)
XXX like
XXX ((pause))
XXX **x one zero↓ minus two x one.**
XXX S1: yea
XXX IS4: ((incomprehensible))
XXX S1: that's fine
XXX oh ok I get it
XXX IS4: so if you set x one to be one
XXX it'll (come to) this
XXX and- and this is the basics
XXX S1: ok I get it°=
XXX IS4: =th- this is the basics of the null space
XXX S1: alright
XXX let's just go over every question because:
XXX it's due next week,
XXX IS4: oh:
XXX S1: u:m
XXX ((pause))
XXX part a: slide six
XXX IS4: ((incomprehensible))
XXX ((hand on mouth))
XXX this one
XXX ((points))
XXX S1: yea
XXX (it says given a solution°)
XXX (.3)find a family of- of the solutions x equals b°
XXX ((reading off the computer))
XXX is that the same thing?
XXX like
XXX IS4: u::m
XXX have- (.1)

15:00

XXX have you seen the: (.)
XXX theorem one?
XXX ((reading something to himself))
XXX ((pause))
XXX S1: yea ((points to screen))
XXX IS4: ok
XXX uh
XXX given the solution (.1)
XXX x star to a x equals b
XXX and any other solution
XXX so all the solutions can be (expressed) in terms of x star
XXX and x zero
XXX if zero is the nullspace^o (.2)
XXX can you- is it clear? (.2)
XXX can you get (.) all this stuff? (.2)
XXX uh:
XXX the null space?
XXX the: (.1)
XXX the given solution and star
XXX can you understand?
XXX S1: [so:
XXX IS4: [uh
XXX let me see if (.) m :
XXX if a x equal-
XXX if you want to get all the solutions (.) of a x equals b
XXX S1: m
XXX IS4: first you- >you- you- you-< you should have a given
solution
XXX to this
XXX ((writing))
XXX to this problem
XXX S1: ok
XXX IS4: like x dot (.)
XXX now at first you-
XXX y - you have get a solution x star.
XXX but you don't know what-
XXX y - you don't know all the solutions. (.2)
XXX and to: (.) to get all the solutions
XXX fr- from this x star
XXX you should first solve x equals (.) zero
XXX S1: (.2) ok
XXX IS4: to get the null space of that
XXX S1: so do Gaussian elimination again?
XXX or
XXX IS4: uh: you mean uh

XXX t- to solve this you- you:
XXX of course you should do Gaussian elimination
XXX S1: right
XXX IS4: and you get the (.)
XXX a- a- and- and you get a family of- a family of solutions
to
XXX this (.) equation
XXX x equals b e- x equals zero
XXX S1: but didn't they give us the family of solutions?
XXX IS4: mm?
XXX S1: didn't they already give us family of solutions?
XXX in: [the problem
XXX IS4: [yea n:
XXX the problem doesn't give you the family of solutions
XXX thi- thi- this should be: calculated (.) by yourself.°
XXX y- you-
XXX it- and the problem gives you (.) one solution to the
XXX original problem.°
XXX the x star
XXX and the family of solutions
XXX th- the family of solutions is a- (.)
XXX the family of solutions of a x equals zero is (.) what you
XXX should solve (.2)
XXX once you solve this
XXX you- you- you- you like
XXX you- you get a family of solutions
XXX you use this plus this ((writing))
XXX will get all the solutions to this (.)
XXX to (.) to this question
XXX do you understand?
XXX S1: um:
XXX IS4: [no?
XXX S1: [can you show me? ((chuckle))
XXX IS4: ok
XXX S1: sorry°
XXX ((pause))
XXX IS4: uh:
XXX for example (.) like°
XXX ((pause))
XXX ((reading computer))
XXX uh: where is problem,°
XXX S1: (.3) um
XXX eight,
XXX yea
XXX IS4: ok

XXX so
XXX ok°
XXX this-
XXX this ten times zero zero zero
XXX is the x star in this ((incomprehensible))
XXX it is a given solution
XXX and that satisfies a x (.) equals b=
18:00
XXX S1: =so all I have to do is just solve for x then
XXX IS4: so
XXX now y- you've get this one
XXX y- you need to know (x) zero
XXX S1: [right
XXX IS4: [right,
XXX u- use of a x equals zero
XXX which is: ((surfing computer))
XXX a is: (.1) here ((points))
XXX so you just need to solve this, (.) equation.
XXX ((starts writing stuff down))
XXX S1: are you using (.1)
XXX [um Gaussian elimination
XXX IS4: [using:
XXX [yea
XXX S1: [and then I get an answer like (director)
XXX and I just add them together
XXX IS4: yea and you will: (.1)
XXX you need to solve this equation (.1)
XXX ((looks at S1))
XXX the right side is zero (.1)
XXX instead of: b (.1)
XXX you know°
XXX b°
XXX the- the- the original:
XXX the original equation is: (.)
XXX b equals to-
XXX the original equation is (.3)
XXX ((writing problem on paper))
XXX is this right?
XXX ((looks to S1, who is looking at computer))
XXX is thirty thirty eight
XXX the b is thirty thirty eight (.) twenty
XXX S1: yea
XXX IS4: ((incomprehensible)) (.) twenty
XXX now you've got the: given solution x star (.1)
19:00

XXX to satisfy this
XXX so
XXX now you know the
XXX ten ten zero zero zero satisfy this equation
XXX ((pause))
XXX ((S1 looking @ computer, IS4 looking @ S1))
XXX S1: yes°
XXX IS4: now:
XXX you should (.) replace this-
XXX this b into zero zero zero
XXX ((writing))
XXX and use of this to get a- to get a numbers
XXX S1: alright
XXX IS4: use of this and you will get a set of (.)
XXX a set of solutions
XXX x zero
XXX and you- you use the:
XXX you use the solution to this one
XXX and plus this x star you will get all the (.) solutions°
XXX ((incomprehensible))
XXX ((pause))
XXX S1: ok so first one you just do (.3) ((reading))
XXX Gaussian elimination?°
XXX IS4: to replace this compu- zero
XXX S1: (.3) I replace this to zero?
XXX IS4: yea
XXX **and solve↑ this problem ((pointing))**
XXX ((pause))
XXX S1: how about (.) b
XXX given the solution,
XXX IS4: and- and y- and what- when- when- when- when
XXX you set this to be zero you find the solution
XXX plus this solutions and this solution
XXX you will get the solution to this problem°
XXX (.3) I [think
XXX S1: [alright
XXX IS4: I think you- you- you- sh-
XXX you should re- ((incomprehensible))
XXX ((hand on mouth))
XXX (.3) [m:
XXX S1: [(I guess this should be good°)
XXX IS4: yea: I think- mm
XXX yea
XXX so (.) to solve- to solve this equation°
XXX a x equals b

XXX and a x equals (c)
XXX to solve this you get a s-
XXX you get a given solution star
XXX ((S1 slightly nods))
XXX and:
XXX you replace this b to be zero
XXX (.2) use- use of thi-
XXX first use of this equation
XXX you- you get solutions to this equation to be zero
XXX x- x zero
XXX and you plus: x star (.1) with x zero
21:00
XXX this is the (.) equation
XXX this is the solution to this one
XXX ((looks at S1))
XXX that- yea
XXX (just remember this) ((hand partially covering mouth))
XXX S1: right (.1)
XXX I don't have any more questions (.2)
XXX thank you