#	Question	Answer(s)
1	Should we always go to the same section?	You do not needed to go need to go to the same section. We track attendance across all the sections through some google forms.
2	Do we need to go to both discussions every week?	Yes please, they cover different materials
3	Are we supposed to do the homework on a sheet and upload a scan of the sheet on gradescope?	Feel free to type or write on a tablet for the original submission. Note that for resubmission there are special policies posted on the course website.
4	Are the discussion links posted?	Not yet, will be posted on the course website soon
5	why is there no arrow above the x for the row vector?	live answered
6	why does the row vector not have an arrow	live answered
7	why does the row vector not have an arrow	live answered
8	whats the difference between note1, note1a, and note 1b?	They are notes from previous semesters for your reference. Basically note 1a and 1b are more detailed version of note1. We will soon release the updated notes.
9	is there a reason for there not being a line above the row vector	live answered
10	is there a way to learn how to visualize beyond 3 dimensions?	Humans are generally bad at visualizing beyond 3 dimensions. Typically, we look for some way to present the information in 3 or fewer dimensions. Visualization is a huge topic of information research.
11	Where are the y values for the points?	
12	Are the slides posted yet?	Slides will be posted after lecture
13	Does the row vector need to have an arrow over it too?	live answered
14	Is it row vector that doesn,Äôt have the vector notation on top of the x? Is that a typo or is it a special thing for row vectors?	live answered
15	would the definition be the same for a horizontal vector?	
16	Are the slides posted anywhere?	Slides will be posted after lecture.
17	do you denote column and row vectors diffrenetly?	Usually it will come from context, relating to matrix operations.
18	how do we know it,Äôs a column vector and not a row vector for the example?	Usually it will come from context, relating to matrix operations.
19	how do we write row vectors using the real number notation she just described?	You can write a column vector and then 'transpose,Äò it to a row vector [if x is a column vector, (x superposition T - meaning transpose) will be a row vector]
20	if it is a 2x3 vector, would that be 6-dimensional vector?	Generally, we only treat vectors as having only 1 dimension, or other wise a single column / row. 2x3 would be a matrix.
21	How do we know if it is a column or row vector from the R notattion?	By default it's a column vector.
22	Why are there 3 x components as opposed to an x, y, and z component?	We'll instead describe the position in the matrix using subscripts.
23	Would it be possible for slides to be posted before lecture? I think it would be beneficial for me to be able to just annotate them during lecture	live answered
24	Does a matrix need a line above the variable?	No, the line above will refer to a vector. Matrices will generally be capitalized.
25	Isn't that a (m - 11) x (n - 11) matrix, since it starts at A11??	You may interpret it as A 1,1. The first 1 means the first row, the second 1 means the first column
26	What is the difference between Note1 and Note1A + Note1B on the site? Do you recommend one over the other?	Those are notes from previous semesters for your reference. We will update the notes soon, but for now you can refer to 1A+1B.
27	are the identity and zero matrices only 3x3 or can they be expanded to any m x n matrix	Identity and zero matrices defintely expand to any M x M. For M x N, there are some specific rules relating to linear independence that we will get into later to help use define zero and identity.
28	why do identity and zero matrixes no contain ,Äòmn,Äô row and column numbers	The 'mn' can be omitted if the matrix is explicitly written in the m by n form

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29	whats the name of the last matrix with lower half being 0	If you're talking about the lower left triangle being zero, we refer to that as a lower triangular matrix.
30	so in terms of notation, 14 would not actually represent 14, but would actually just signify the place on the 1st column and 4th row?	Inside the matrix, yes
31	do they need to have the same dimensions?	
32	what is the other name for upper triangle matrix?	I believe we just call that an upper triangular matrix. Depending on its contents, there may be other useful properties, but upper triangular is most general.
33	Can we get the notes before the lecture (at least one or two days)?	We will try our best to get the updated notes posted before the lectures. In case not, there are notes from previous semesters already on the website which are good references.
34	What do we benefit from these matrixes?	We will see over the next few weeks that putting things in matrices gives us a lot of power analysis tools.
35	Is the second method like multiplying two matrices?	
36	why doesnt x have a vector arrow?	In this case, its a single number. We'll comb through this before we release the slides.
37	Could we have the Q&A on a piazza thread rather than in zoom, therefore, the questions are saved for students to read through after the lecture? Other students ask questions I would've never thought of asking which is really helpful to read through	The Q&A will be saved to Zoom. But I can bring this up to the course staff and see -Bob
38	Was the last lecture, on imaging , an overview of the course or the first lesson ? I struggled a bit with it , so Should I go to office hours for it ?	Overview! First lecture was meant to give a big picture of the system we're going to study in this first module. We'll slowly fill in the details.
39	what is tenure lol	live answered
40	do the diagonals always have to go from upper left to lower right?	There can be '0's in the diagonal elements.
41	could you go over why those points are called pivots again?	This will be discussed in details later at the Gaussian elimination with augmented matrix
42	skibidibopmmdada'); DROP TABLE `Homework Assignments`;--	
43	how was the joy of not working?	
44	Is upper triangular the same as echelon form?	Not necessarily. Upper triangular requires that the matrix diagonal is filled. Echelon form does not.
45	do we need to indicate row operations between matrices in our eliminations or is ~ sufficient?	~ is fine
46	are there sections on fridays	No, all sections are Monday - Wednesday. There are lots of OH on Friday though.
47	i didnt understand the part about the upper triangle matrix, why is it significant? What do the pivots do?	You will soon see it when we reach the Gaussian elimination with augmented matrix
48	Why do you subtract from the x-value specifically can you alter the y instead?	Mathematically, there is no problem starting with y instead of x. For Gaussian elimination, we will generally work left to right with the variables.
49	what does LSE stand for again?	"Linear System of Equations"
50	what does Lse stand for?	Linear System of Equations
51	How was the first method different from the second? Weren,Äôt both elimination?	You can use the same set of operations to solve in a system of equations and Gaussian elimiation. which is part of the point :)
52	How did you find the point (2, 1)?	We solve first for y by doing an operation on the 2nd equation with the first. Then we plugged y back in to the first equation and solved for x.
53	I thought it was positive 9	
54	Should we know every method that is brought up in lecture or will it be enough to just know the augmented matrix method (I'm assuming that's the method this course mainly uses)?	Yes you are right, the augmented matrix method is the key point
55	why did the top row stay the same?	
56	What did we do exactly in order to get the bottomw row, I didn,Äôt quite understand?	
57	Wouldn't 2r1 -r2 give +9 instead of -9?	
58	Why use upper triangle? It seems like more work	
59	how did you get the x value from the matrix?	live answered
60	Why wouldn't it be R2 - 2R1?	

#	Question	Answer(s)
61	8+1=9	
62	can we multiply the equation we are replacing with a constant instead and add it to another equation?	yes, multiplying a row by a constant is a safe operation.
63	how is gaussian elimination (making the LSE into an upper triangular matrix) different than the first method professor waller tried	Mathematically, LSE and gaussian elimination are equivalent, but Gaussian elimination gives us a systematic way to solve these problems, especially when the matrix gets very large.
64	How did she get negatives on the bottom??	
65	isnt it supposed to be +9?	
66	shouldnt it be 0 9 | 9 in the matrix if its 2R1 - R2?	
67	It shouldn,Äôt matter if we do 2(r1)-r2 or r2-2(r1) as long as you get that 0, right?	
68	Is the 9 in R2 supposed to be negative or positive?	
69	why is it -9 and not +9 in the gaussian elimination?	
70	We could also do the same by getting to a lower triangular matrix first, right?	Mathematically, yes we can go to lower triangular just fine. By convention, we do upper triangular though.
71	Is gaussian elimination a method generally used in situations with more LSE's than can be possibly solved by hand?	Mathematically, LSE and gaussian elimination are equivalent, but Gaussian elimination gives us a systematic way to solve these problems, especially when the matrix gets very large.
72	Why use upper triangle? It seems like more work?	Mathematically, LSE and gaussian elimination are equivalent, but Gaussian elimination gives us a systematic way to solve these problems, especially when the matrix gets very large.
73	could you rearange the order of the functions in order to make it easier to make an upper triangle matrix?	Yes, rearranging the order of the equations will make no difference.
74	if you do the 2r1-2r2 thing on the second row, wouldn,Äôt you get positive 9 from 8-(-1)	
75	does it matter what order you do the elimination? for example 2R1 - R2 vs R2 - 2R1	Both ways are correct :)
76	How did you get 2 1 1 in the first row?	The first equation is 0x+2y + 1z = 1
77	is the first equation 2y-z = 1 or 2y -2 = 1?	2y+z = 1
78	are there not 2 z's for the first row?	No, the first equation is 2y + z + 1
79	why did you swap eq1 and 2?	We want to make our matrix upper triangular. Swapping the row helped us get a 1 in the upper left corner. There is no effect on the solution from doing so.
80	why do you want to make the first component of the first row 1?	This helps us get to upper triangular and will simplify our lives when we complete the gaussian elimination.
81	why do r1-r3 instead of r3-r1?	Either way will be fine :)
82	why isn't it positive 6 and negative 9	We chose to do R3-R1. If we did R1-R3, then we would get that results. They are equivalent.
83	I,Äôm a little lost what happened in that last step	
84	shouldn't z = 3	live answered
85	what did you do for the last row?	
86	isnt z = 3?	live answered
87	do you have to multiply the second row by 3?	
88	why is z = 12 and not = to 3?	live answered
89	I am confused why it becomes 4	live answered
90	Whats the row equation for the last matrix?	
91	what happened between the second to last matrix to the last matrix??	live answered
92	Potential suggestion for the professor: I think she,Äôs on an Ipad, so if she got notability (the app) it would make a lot of things much easier for her, including copying and pasting matrices and drawing straight lines. A lot of other professors use it.	Thanks for the tip :)
93	Can we transform the matrix using columns as well?	
94	what,Äôs the R notation for the one where we get the traingle	it means 'row'
95	is the proper way to get 0,Äôs at the 3rd row is to do R1-R3 or R3-R1?	Mathematically, either is fine
96	How did she zero the y of row 3?	

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97	Could you scroll to the top of the screen to the initial system of equations, afterwards?	
98	where does the 5 -2 3 comes from	
99	do we need to write the equations on the left if we're doing matrix manipulation	
100	How did a2,3 become 0?	
101	What is the importance of having these systems in a matrix	Mathematically, LSE and gaussian elimination are equivalent, but Gaussian elimination gives us a systematic way to solve these problems, especially when the matrix gets very large.
102	Can you please write the equation on the side for how you got the second matrix	
103	Is this our only guassian elimination lesson? Because I actually have no idea what just happened	We will go over this again in discussion.
104	Is this gaussian elimination or is this just solving system of equations with an augmented matrix?	Solving systems of equations with an augmented matrix is gaussian elimination.
105	what was the final answer in (x,y,z)?	
106	whats the biggest matrix ever solved lol	
107	I,Äôm confused about the order in which you do subtraction with this notation. If you write R1 - R3 is that subtracting R3 from the values of R1 or subtracting the values of R1 from R3?	It should be subtracting R3 from the values of R1
108	Is the goal of Gaussian Elimination to end with an identity matrix where 1 signifies the variable with a resulting value for each one on the right?	yes!
109	How did the proffessor get 0 2 0 in the second line of the 3 by 3 matrix?	After solving for the last row, we did back substitution upward to cancel variables.
110	so to clarify, gaussian elimination involves transforming it into an upper triangular matrix, and this last part we did to get it an identity matrix is optional and just called matrix manipulation?	Gaussian elimination include all of the steps
111	How is Gaussian with the upper triangle method more systematic? It seemed to take more time and seemed easier to make mistakes.	Its systematic in that it has a clean algorithm that you can program into a computer. It may seem somewhat obscure now, but we'll review it in depth in discussion.
112	why would we want to swap rows?	On paper, its mostly a human improvement. But there are potential computability benefits in some applications.
113	what were the things that we are allowed to do in gaussian elimination? sorry i missed that part	Multiplying a row by a constant number; add a row to another row; swap two rows
114	is gaussian elimination a nicer way of depicting regular elimination? (I learned the same thing in HS but without the matrix)	
115	How is Gaussian with the upper triangle method more systematic? It seemed to take more time and seemed easier to make mistakes.	The benifits will become significant in solving a large number of equations by computers.
116	What are the goals of gaussion elimination? I didn,Äôt get to take notes on that slide	
117	what are the goals of gaussian elimination algorithm again?	
118	For the rocket trajectory example, would these linear equations have to be constantly calculated for each moment of the whole flight?	Yup! This belongs to a more complicated class of control problems that are covered in EECS16B.
119	so with gaussian elimination do we always want to try to achieve the identity matrix?	Generally yes. Gaussian elimination can also be used when we have a more general M x N matrix (as opposed to M x M), where the identity matrix is not well defined.
120	will we get more practice with this in discussion?	yes!
121	What happens when the number of rows and the number of columns are drastically different?	You can still perform the Gaussian elimination process, but might end up with no solution or infinite number of solutions
122	they are scalar multiples	yup!
123	theyre parallel?	You are right, actually they are the same straight line
124	Professor used the word pivot, can you please define that?	live answered
125	what do we mean by pivot?	live answered
126	Where are the pivots of a matrix?	live answered
127	Why is having 0 in the pivot a red flag?	It's a red flag that there is no unique solution.

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128	so for solvable systems of linear equations, will pivots never equal 0 no matter what operations we do?	That's not always true. You might get a row with all 0. You will see more examples in the discussion
129	Do you mind explaining what a pivot is again?	live answered
130	would the change between the first and second matrixes for the scalar multiple pair be 2r1-r2?	
131	so ending up with the zero matrix means that there are infinite solutions?	Not necessarily. The rows other than the zero row may still have a solution.
132	do we still call it a pivot if it,Äôs in the last column	We only refer to them as pivots in the standard matrix part, not the augmented column.
133	gaussian elimination wouldnt work if the pivot is in the agumented column right?	We only refer to them as pivots in the standard matrix part, not the augmented column.
134	are pivots just a term for upper triangular matrices or are they about the diagonal for any matrix?	Specific for upper triangular
135	sorry if this has been asked, but is there a lecture attendance form for this class?	
136	a little unrelated, but what,Äôs the difference between note 1, note 1a, and note 1b on the course site? are they all different?	They are notes from previous semesters, the contents are similar and you can refer to the 1A and 1B notes for now. We will post updated versions soon.
137	I might have missed this , but can we divide ?	Dividing by a constant is the same as multiplying by a constant
138	What is the augmented column?	The augmented column is the right-most column in the augmented matrix
139	what does noise mean in this context?	live answered
140	what does ,Äònoise,Äô mean in this case?	live answered
141	when creating the upper triangular matrix do the pivots always have to be equal to 1?	Yes we want them to be 1 in the end
142	if we get an outcome like this, does that signal that the two lines are definitely parallell, or are there separate cases?	If we get 0-pivot, then at least in linear equations, you can visualize them as parallel. We will give a more formal definition to this when we get to null spaces.
143	can we divide by rows? like R1/R2	Nope, that will change the solutions of the equations.
144	how do we incorporate errors or noise such as what the proffessor described into our LSE's during Guassian elminiation?	There are methods for dealing with errors using redundant measurements that we will talk about later in the semester.
145	Could you please repeat the order of gaussian elem?	
146	can there be complex solutions for parallel lines?	No. Even if the lines have complex values, if they are parallel, they have no solution.
147	is infinitely many solutions and unique solution considered consistent	yes
148	is it possible that no amount of reordering the equations in a matrix can get rid of all the zeros on the pivots? like if there were no solutions	yes
149	I thought that a pivot was the first nonzero value in each row of a matrix in REF but the professor keeps saying '0 pivots' are they defined differently in this class?	strictly speaking yes. We're being a little loose with the definition.
150	Is this an example of opacity?	
151	so the dog and cat variables are basically matrices themselves, right?	Yes, but we can transform them to vectors and do the same operations we've been talking about.
152	how do you determine if they're linearly independent?	We will define that formally next week
153	do we need to write the equations on the left if we're doing matrix manipulation	
154	what exactly would be the system we solved to figure out what the individual images are? is it based on the tomography stuff we did yesterday?	
155	what is an eigenvalue	
156	Is there discussion this week?	Discussion starts on Monday. See Piazza for details.
157	Where can we access these notes?	Lectures notes will be posted shortly after lecture.
158	is there anything posted on how we can familarize our selfs more with this lecture especially if this is the first time seeing matrixes and such	There are lecture notes and further resources on the course website. We will also be talking about this more in discussion next week. And of course, office hours are always available.

#	Question	Answer(s)
159	Not lecture related, are the "Practice Sets" a submittable part of the hw, or are those just for our own practice?	They are just for practice :)
160	in the example, what do the variables represent? what value are the dog and cat pictures supposed to be? Also how do we "calculate" a value for the overlapped picture?	We can represent the information of the pictures in very long vectors. You'll see this more in the coming labs.
161	or will there be anything posted to get more familiar with this	live answered
162	what exactly does it mean to normalize a row?	Multiply (or divide) some constant so the first non-zero element in that row (the pivot) becomes 1.
163	Why is it called Gaussian Elimination?	It was invented by Gauss, and we eliminate / reduce the variables in each equation.
164	could you not make the diagonals into 1 and then just use algebra to solve for the variables later?	
165	do you only normalize R1 if the numbers divide evenly? What would we do if it was 3 2 5 for example?	
166	when is hw due, as in till what time on friday can we submit?	
167	what does normalize R1 mean?	It means R1/a so the first element becomes 1
168	Like why specifically R1	
169	so normal matrix->upper triangular->diagonal->identity matrix?	
170	what,Äôs the difference between note1 and note1A/1B? Which one should we use?	