#	Question	Answer(s)
1	What is the difference between rank and basis?	Rank is the number of vectors required to describe the span. The basis is one such set of vectors that describes the span.
2	can we have a zero rank if all cols are lin dep	Zero rank would mean zero dimensions, which is only possible with only the zero vector. If you have a matrix that has just the same vector repeated a whole bunch, that's a rank 1 matrix.
3	so the rank is just # of pivots in rref form?	yup!
4	all the places "it" cannot get to, what is the "it" that is referred to? the matrix A?	"It" would be the b vector in an Ax=b scenario. "Getting somewhere" means making a linear combination of the columns of A.
5	"null space its all the vectors that cannot be reached" but is in the null space of A but i can be reached by multipling everything by 0?	The 0 vector is always in the null space. What we care about is nonzero combinations of the columns of A that send us to 0.
6	What is the difference between | and s.t.? are they interchangeable?	in the set notation we use | for s.t. They have the same meaning
7	yes	live answered
8	oh oops	live answered
9	how is yellow a subspace sinec it does not pass by 0	Yellow is not a subspace. We're just trying to show what we can't reach.
10	How does vector 0 show closed under scalar multiplication and vector addition	For scalar multiplication, we have to be able to multiply by any scalar, including 0. For vector addition, we have to be able to add any other vector in space, which can include the negative of yourself, i.e. v - v = 0. So the 0 vector being included can be inferred
11	would the null space for a zero matrix be r^n, where n is the number of columns?	Yes!
12	what‚Äôs the rank of {[1,1,1], [2,4,6]}?	it's rank 2
13	What would the picture of the nullspace look like if z vector were [0 0 1]?	It will just be the (0,0,0) point
14	Why is the null space ‚Äúeverywhere else but the xy-plane,‚Äù and not strictly the z-axis, if the soln to Ax=0 is { [0 0 z], zER }?	Yes the null space is strictly the z-axis
15	why is dim(Null(A)) = 1?	Because we have one free variable for the equation Ax=0
16	is # dim of null space always 1?	nope, it depends on the A matrix
17	would the nullspace for a matrix with lin dependent columns have infinite solutions?	A vector space (except the space with only 0 vector) will contain infinite number of vectors, so it can contain all the solutions
18	why is the null space all the places it can't get to?	Strictly speaking it's not all the places it can't get to. It has to be the solutions to Ax=0
19	how is the null space expressed when it has more than one dimension?	We can express it by the span of multiple vectors
20	If we have another col with all 0s, would the dim(NullSpace) be 2 then?	does the x s.t. Ax = 0 definition still work?
21	how woould we express the nulllspace in the last example?	oops get lost on which example you are refering to. Maybe you can put the matrix in the Q&A, or review the lecture slides later.

22	is the col space and row space the same? since the number of ind col = number of ind rows	Their dimensions will be the same, but the two spaces are not the same
23	I‚Äôm confused by the difference between span and vector space	Vector space is a broader concept. A span of vectors is a vector space, but a vector space is not necessarily a span of vectors.
24	In the last question for the 3x3 matrix 1 0 0 0 1 0 0 0 0, two columns were linearly independent and there was one zero vector. Because of this, shouldn't the dimension be 2 and not 3	Yes the column space dimension is 2
25	why can‚Äôt [0.5 0.7] and [1 0] be a basis set?	They can be. They're a linearly independent pair, which is sufficient for all of R2.
26	what‚Äôs the difference between rank and dimension? are they oftentimes the same?	Yeah oftentimes they are the same value. Rank is a property of matrices, dimension is a property of vector spaces. When you connect them by defining the column space of a matrix, they will become the same number.
27	would the span of {[1,1,0],[2,3,0]} be a plane in R3 not R2? and the span of {[1,1,0],[2,3,0],[0,0,1]} be R3?	Yes that's correct!
28	For any R^n, the dimension of the basis must be n?	Yes!
29	what does the big F mean?	A set of scalars I believe
30	if 0,1 and 1,0 weren't in the set, what would be the most efficient set?	Based on what the professor said, you could pick any two vectors as long as they aren‚Äôt dependent
31	is col span = row span since same number of lin ind? how come same dimensions but different spaces?	Yes col span = row span. We can have different spaces with the same dimension. For example, span{[1 0]} vs span{[1,1]}
32	Is there a intuitive meaning of det() of an matrix?	There will be a graphic example right now
33	whats the span of {[1,1,1], [2,4,6]}?	It would be a plane in R3, since the vectors are linearly independent. We can just describe that as {[1,1,1], [2,4,6]}.
34	the graph parallelogram analogy kind of reminds me of a dot product graphical representation, is this related at all?	Yes dot product also relates to the angle between the two vectors, or the projection of one vector on the other one. We will come back to that in Module 3. Determinant is the area.

35	can we use det(A) to check for linear dependence?	yes!
36	would the graphical representation be volume for 3 3D vectors?	yep! There's a nice image in Note 9 about it. It would further extend into 4+ dimensions, but we're bad at drawing in 4D+.
37	does det only work for square matrices?	Yes!
38	what about a determinant for a 3x3?	We'll talk about that now. The area idea extends to a volume. You won't have to memorize the formula for that in this class.
39	are all basis square if you write the set of vectors as matrix	Yep. It takes N vectors in R^N, so you will get a square matrix.
40	Why do we have determinants?	One way you can think of determinant is giving you some intuition on what a matrix transform does. Think of the identity matrix as having determinant 1. Determinants greater than 1 will make the area bigger, etc. Mathematically though, it fits nicely in our framework of linear independence (det(A) = 0 -> LD columns).
41	Could you repeat how you got the areas?	
42	why is the square equal to b times c?	I was confused about this too but if you look at the picture and don,Äôt assume it,Äôs a sqaure (assume it,Äôs a rectangle) then the height was D + C - D = C and the length was A + B - A = B
43	for the second matrix, the determinant gives -2, but area can't be negative	The negative tells us something about the quadrant that we're in
44	what does knowing the determinant tell us?	Directly related to our course, you can determine linear dependence and find out eigenvalues with the help of determinants. But it's a powerful math tool for a lot of other things.
45	whats the intuitive meaning of enclosed area? (doesn,Äôt two vectors in the vector reach areas outside of enclosed area as well?	It's the parallelogram defined by the two vectors
46	sorry i meant in terms of the matrix..	
47	can we now always use determinant to check for linear dependence? and can we also use it for higher dimension matrices even though we didn,Äôt go over the formula for higher dimensions?	yep!
48	How would one go about systematically finding the pattern of a transition matrix (if we can,Äôt deduce by observation)?	If you're asking about how to set up the transition matrix, try going node by node (e.g. Berkeley and Stanford in this example), and write out all the outgoing quantities. That should form your columns.
49	will the resulting vector always add to 1?	Yes since we have a conservative system here and the initial state vector adds up to 1
50	If this is what page rank uses, does this mean some websites can become obsolete?	At least in this context, yes. If there aren't enough paths to a website, there will eventually be no users. However, this is a _massive_ oversimplification of Google's algorithm today.
51	wait isn't suppose to be 1-1/2^T OVER 1/2^t	for x(t)
52	how did we get the x(t) vector?	live answered
53	could you scroll up slightly	live answered
54	eighen values will help us find the steady state?	Yes!

55	why would it be wrong to assume I = Q here?	Short of saying most matrices are not the identity, we're looking for this interesting behavior of a general Q that it doesn't change the vector x after the transform.
56	is Q-I the same as I-Q?	In this case, you can do either
57	which equation is the steady state solution	The first equation x = Qx is the problem setup for steady state. We haven't actually arrived at the solution yet.
58	basis variable = pivot point?	Yes!
59	why is it 0 on top for Null(Q-I)?	
60	Is eigenvalue a scalar?	yes!
61	how do you go from an eigenvalue -> eigenvector -> eigenspace?	By solving (Q-lambda*I)x=0, we get the eigenvalues. From there we get Qx=lambda*x, where we solve for the eigenvectors. The eigenvectors give us the eigenspaces.
62	in that example is the eigenvector = [0 | 1] ? for eigenvalue 1	Yes
63	is it null(Q-lambda*I)?	Yes
64	isnt the eigenspace null(Q-lambda*I)	yes
65	wait what did she changed?	The equation should be null(Q-lambda*I)=0. She added the lambda term.
66	how come matrix = scalar	In general matrix != scalar, but the eigenvalues and eigenvectors are important properties of square matrices, a special case where multiplying by the matrix is equal to multiplying by the scalar.
67	can 0 be an eigenvalue or eigenvector?	0 can be an eigenvalue and ties into null space. The 0 vector always has eigenvalue 0, so its trivial.
68	why do you set the det = 0?	We identified that we want x in the null space, so we want to find the case that gives us LD vectors.