| # | Question | Answer(s) |
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| **1** | Whats the mathematical term for trivial again? | The trivial solution can refer to a bunch of different things. For our usage, it just means when things are all zeros. i.e. a specific vector or scalar are zero. |
| **2** | What is the name of this equation? | We don't have a formal name for it. You can refer to it as a the eigenvalue / vector problem setup. |
| **3** | What does lambda = 0 imply? | lambda = 0 means we have some null space |
| **4** | What is the difference between eigenspace and eigenvector? What does non-empty nullspace mean? | Eigenspace contains all the eigenvectors corresponding to one eigenvalue. Non-empty nullspace means there are non-zero vectors in the nullspace. |
| **5** | to span Rn u need at leats n vectors with n dimensions? | Yes we need n independent n-dimensional vectors |
| **6** | What does it mean for n out of k vectors to be linearly independent? Isn't linear dependence all-or-nothing (either they are all linearly dependent or they aren't?). | We can isolate some subset of the vectors, i.e. k of the n vectors. and we can selectively remove ones that are making the set linearly dependent, leaving us with k LI vectors. |
| **7** | Whats n | n is the dimension of space (R^n) we want to span |
| **8** | Non singular means that there's 1 solution? | Non-singular means invertible |
| **9** | what was the relation between basius and eigenvalue lamda? | They're really two different concepts. Basis is used to describe a vector space. Eigenvalues are properties of matrixes. |
| **10** | In the third step are we saying that the null space of N is the eigenvectors? | We're saying the null space of A-lambda*I is the eigenvectors |
| **11** | even though we are finding the determinant of B, we are still finding the eigen values and eigen vectors of A right? | Yes, we solve the eigenvalues lambda from the det(B) = det(A - lambda I) = 0 equation, and then we solve for the eigenvectors from the (A - lambda I)x = 0 equation. The eigenvalues and eigenvectors are of the matrix A. |
| **12** | I know we've been over this a lot, but I'm still a little confused why we take the determinant of A-lambdaI when it equals 0 | We want the equation (A - lambda I)x = 0 to have non-zero solutions (which are the eigenvectors). This means (A - lambda I) has non-trivial null space or the columns of (A - lambda I) are linearly dependent, so we have det(A - lambda I) = 0. |
| **13** | what does the triple lines (= with an extra -) mean? | triple equals is "equivalent to" or "strictly equal". In this context, we're saying saying that we want the determinant equal to 0, so we're defining it to be equal to zero. |
| **14** | what if the eigenvalues have non-real values? | That will be beyond the scope of this course. We will only require real eigenvalues. But yes it's possible to have complex eigenvalues. |
| **15** | What if A - lambda I has a non zero determinant? | We want to find some lambda to make the determinant zero. There will always be solutions in the complex number domain. But we will only require real eigenvalues in this course. |
| **16** | are those primes or superscript v's? | superscripts |
| **17** | What does v mean? Why do we use rv instead of only using r? | r^(v) is specifically the representation of r in the V basis. |
| **18** | how did he get -sintheta and ctheta for the y vector? | The y' vector has an angle theta from the y axis, so an angle (pi/2 + theta) from the x axis, and we know cos(pi/2 + theta) = -sin(theta) and sin(pi/2+theta) = cos(theta) |

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| **19** | How do we get the inverse rotation matrix? | One way is to mechanically take the inverse. Alternatively, recognize that reversing a rotation is equal to rotating by the negative of what you've already done. i.e. If you've rotated by theta, the inverse is to rotate by -theta. So then you can just plug that into the rotation matrix. |
| **20** | why is x prime [costheta, sintheta]? | x' has an angle theta theta from the x axis. We assume it has a length = 1, so the x component is cos theta and the y component is sin theta |
| **21** | What does rv mean? Why don't we use only r instead of both rv and r? | r^(v) is specifically the representation of r in the V basis. |
| **22** | So can we say that we can rotate the basis vectors to get new basis vectors? | Yes in this case. Sometimes we also need a scaling. |
| **23** | is the red vector r or r’ | r and r' are the same vector, but written in terms of different sets of basis. |
| **24** | so change of basis involves finding the same vector using different components? | Yes! |
| **25** | this stopped makin sense | Haha, rewatch lecture. Hopefully that helps? |
| **26** | big V is a transition matrix for the basis V right? | big V is a matrix whos columns are the basis V, which in this case are the eigenvectors of A. |
| **27** | what is multiplicity? | multiplicity is when we have an eigenvalue show up multiple times for a matrix's characteristic polynomial. e.x., for the identity matrix, it has an eigenvalue of 1 with multiplicity 2. |
| **28** | could we please see the “takeaway” section again after lecture ends? | live answered |
| **29** | could A = VLambdaV^-1 be interpreted as A = Lambda | No, remember that matrix multiplication is not commutative. so we need both V and V^(-1) where they are. see the diagonalizating diagram |