Quiz for final exam

(!) This is a preview of the published version of the quiz

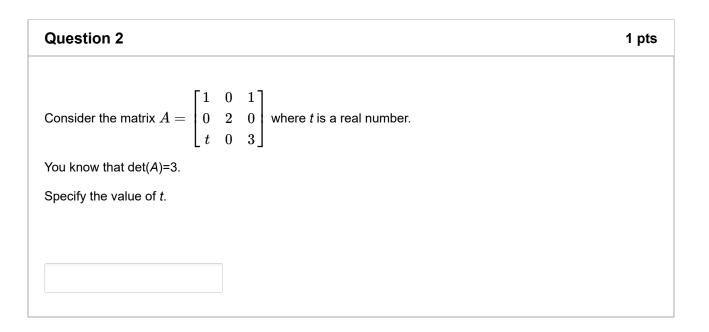
Started: May 15 at 1:10pm

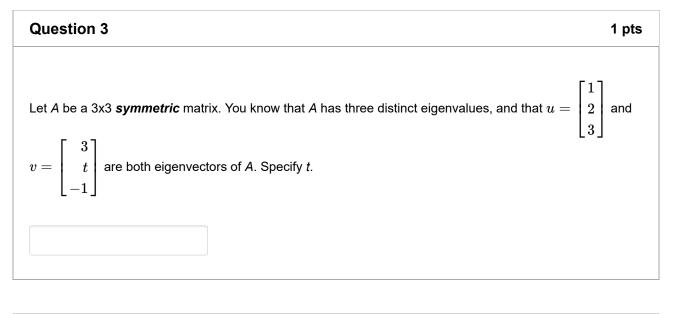
Quiz Instructions

This exam is timed. You have 60 minutes from the time that you start. There are 12 questions total, so do not linger if you have difficulties with one question - you only have 5 minutes for each one.

Several of the questions ask you to identify which of a given number of statements are true or false. Be sure to write "T" or "F" in the given box (without the quotation marks). Do NOT write "t" or "f" or "true" or "false" or anything like that, just T or F.

| Question 1 | 1 pts |
|--|-------|
| | |
| Let <i>A</i> and <i>B</i> be 5 x 5 matrices. | |
| Mark which of the following statements are necessarily true (write either T or F in the box provided): | |
| (a) If rank(A)=5 and rank(B)=3, then rank(AB)=3. | |
| (b) If rank(A)=3 and rank(B)=3, then rank(AB)=3. | |
| (c) If rank(A)=3, then dim(ker(A))=2. | |
| | |





| Question 4 | 1 pts |
|---|-------|
| Let A be a 3x3 matrix. You know that A has precisely two eigenvalues, $\lambda_1 = 1$ and $\lambda_2 = 2$. Let p d the characteristic polynomial of A, so that $p(\lambda) = \det(\lambda I - A)$ as usual. Which of the following through options <i>could</i> be the characteristic polynomial of A: | |
| (a) $p(\lambda) = \lambda^3 + \lambda$ | |
| (b) $p(\lambda)=\lambda^3-3\lambda^2+3\lambda-1$ | |
| (c) $p(\lambda)=\lambda^3-3\lambda^2+2\lambda$ | |
| (d) $p(\lambda) = \lambda^3 - 4\lambda^2 + 5\lambda - 2$ | |
| | |
| (d) | |
| (a) | |
| (b) | |
| (c) | |
| | |

| Question 5 | | 1 pts |
|--|---|-------|
| The matrix $\begin{bmatrix} -4\\ -3\\ 4 \end{bmatrix}$ | $ \begin{bmatrix} -2 & -3 & 0 \\ -1 & -3 & -2 \\ 2 & 1 & -4 \end{bmatrix} $ is row equivalent to the matrix $ \begin{bmatrix} 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 2 \end{bmatrix} . $ | |

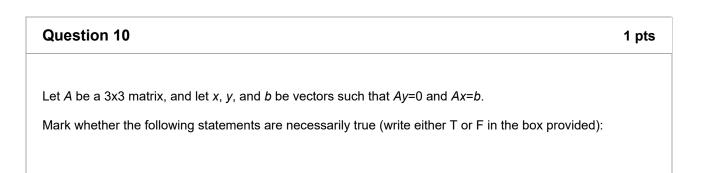
| Let | $\left[egin{array}{c} x_1 \ x_2 \ x_3 \end{array} ight]$ | denote the solution to the linear system | $\begin{bmatrix} -4 \\ -3 \\ 4 \end{bmatrix}$ | $-2\\-1\\2$ | $\begin{bmatrix} -3 \\ -3 \\ 1 \end{bmatrix}$ | $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$ | $\begin{bmatrix} 0 \\ -2 \\ -4 \end{bmatrix}$ | | |
|------|--|--|---|-------------|---|---|---|--|--|
| Spee | cify th | e value of x_2 . | | | | | | | |
| | - | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |

| Question 6 | 1 pts |
|---|-------|
| | |
| The matrices A and B are both of size 4x4. You know that $rank(A)=3$ and that $det(B)=1$. | |
| Mark whether the following statements are necessarily true (write either T or F in the box provided): | |
| (a) The equation $Bx=y$ has a solution for every 4x1 vector y. | |
| (b) The equation <i>ABx=0</i> has infinitely many solutions. | |
| (c) The equation $Bx=Ay$ has a solution for every 4x1 vector y. | |
| (d) dim(ker(<i>A</i> + <i>B</i>)) = 1. | |
| | |

| Question 7 | 1 pts |
|--|-------|
| The matrix $A = \begin{bmatrix} -1 & -2 & -3 & -5 & -1 \\ 1 & 0 & 1 & 1 & -1 \\ -1 & 0 & -1 & -1 & 2 \\ -2 & -1 & -3 & -4 & 1 \end{bmatrix}$ has the RREF $B = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 2 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$. Mark whether the following statements are necessarily true (write either T or F in the box provided (a) The first, second, and fifth columns of <i>A</i> form a basis for the column space of <i>A</i> . (b) The first, second, and fifth columns of <i>B</i> form a basis for the column space of <i>A</i> . | :(t |
| (c) The first, second, and third rows of <i>B</i> form a basis for the row space of <i>A</i> . | |
| | |

(d) rank(A) = 3.

Question 8 1 pts Let $V = \mathcal{P}_4$ denote the vector space consisting of all polynomials of degree four or less. Consider the subspace W consisting of all polynomials in V that are even. In other words, $W = \left\{ p \in V \colon p(x) = p(-x) ext{ for every } x ight\}.$ Specify the dimension of W. **Question 9** 1 pts Let A be a 3x3 matrix that has the eigenvalues $\lambda_1=0$, $\lambda_2=1$, and $\lambda_3=3$. Mark whether the following statements are necessarily true (write either T or F in the box provided): (a) The matrix A^2 has 9 as an eigenvalue. (b) There exists a positive integer *n* such that $A^n = 0$. (c) *A* is necessarily invertible, and A^{-1} has 1/3 as an eigenvalue. (d) There is a basis $\{v_1, v_2, v_3\}$ for \mathbb{R}^3 consisting entirely of eigenvectors of *A*.



1 pts

| (a) The vector $u = x+y$ satisfies $Au=b$. | |
|--|--|
| (b) The vector $v = x - 2y$ satisfies $Av=b$. | |
| (c) The vector $w = 2x+y$ satisfies $Aw=2b$. | |
| | |

Question 11

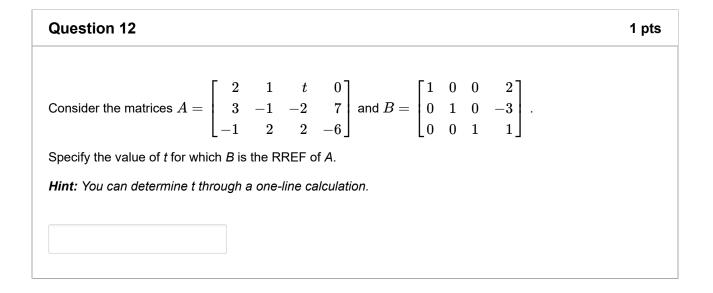
Let $V= ext{span}\{[1,-2,1],\,[-1,0,1]\}$ denote a plane through the origin in \mathbb{R}^3 .

Let x=[1,-1,3] denote a vector in \mathbb{R}^3 .

You know that the orthogonal projection of x onto V is the vector y = [0, -2, 2] .

Specify the *square* of the distance *d* between *V* and *x*, so that $d = \inf\{\|x - v\| : v \in V\}$.

NOTE: Be sure to specify d^2 , and not d itself. (To avoid having to evaluate a square root, of course.)



No new data to save. Last checked at 1:42pm Submit Quiz