Quiz 1_ Linear...

Quiz 1: Linear Algebra

Due Sep 19 at 11:59pm **Points** 8 **Questions** 8 **Available** Sep 15 at 12am - Sep 19 at 11:59pm
Time Limit None **Allowed Attempts** Unlimited

This quiz was locked Sep 19 at 11:59pm.

Attempt History

	Attempt	Time	Score
KEPT	Attempt 5	1 minute	8 out of 8
LATEST	Attempt 5	1 minute	8 out of 8
	Attempt 4	3 minutes	6 out of 8
	Attempt 3	5 minutes	6 out of 8
	Attempt 2	23 minutes	3 out of 8
	Attempt 1	72 minutes	1 out of 8

Score for this attempt: 8 out of 8
Submitted Sep 17 at 4:43am
This attempt took 1 minute.

Question 1 — 1 / 1 pts

Which of the following vectors is not in the span of the vectors $\begin{pmatrix}1\\1\\0\end{pmatrix}$ and $\begin{pmatrix}0\\1\\1\end{pmatrix}$?

- $\begin{pmatrix}-2\\4\\6\end{pmatrix}$ $-2\vec{a}+6\vec{b}$
- All are in the span
- $\begin{pmatrix}0\\0\\0\end{pmatrix}$ $0\vec{a}+0\vec{b}$
- $\begin{pmatrix}-3\\-10\\-7\end{pmatrix}$ $-3\vec{a}-7\vec{b}$
- Correct! $\begin{pmatrix}3\\-5\\-7\end{pmatrix}$

Question 2 — 1 / 1 pts

Is the set $\left[\begin{pmatrix}4\\5\\3\end{pmatrix},\begin{pmatrix}1\\0\\2\end{pmatrix},\begin{pmatrix}0\\0\\0\end{pmatrix}\right]$ **a basis for** $\mathbb{R}^3$**?**

- Cannot be determined
- Yes
- Correct! No ✗

Question 3 — 1 / 1 pts

If $\vec{u}=\begin{pmatrix}2\\4\end{pmatrix}$ and $\vec{v}=\begin{pmatrix}4\\3\end{pmatrix}$, what is the projection of $\vec{u}$ onto $\vec{v}$?

- $\begin{pmatrix}2\\1\end{pmatrix}$
- $\begin{pmatrix}1\\2\end{pmatrix}$

- $\begin{pmatrix}12\\5\\16\\5\end{pmatrix}$
- Correct! $\begin{pmatrix}\frac{16}{5}\\\frac{12}{5}\\5\end{pmatrix}$ $proj_{\vec{v}}\vec{u}=\frac{\vec{u}\cdot\vec{v}}{\|\vec{v}\|}\vec{v}=\frac{8+12}{5^2}(3,4)$

Question 4 — 1 / 1 pts

Consider the matrix $A=\begin{pmatrix}3&0\\0&1\end{pmatrix}$, what is the spectral norm of A^{-1}?

largest singular value

- Correct! 1 — $A^{-1}=\begin{pmatrix}\frac{1}{3}&0\\0&1\end{pmatrix}$, $\|A\|_2=\sup\{\|A\vec{x}\|\}=\sigma_{11}(A)$, largest singular val $=1$
- $-\frac{1}{3}$
- 3
- $\frac{1}{3}$

σ_{11} ⇒ first row and 1st col of Σ matrix put in descending order

Question 5 — 1 / 1 pts

Let $A^{-1}=U\Lambda^{-1}U^{-1}$ be the eigendecomposition of A. Assume A is symmetric.

If $A^{-1}=\begin{pmatrix}-\frac{1}{3}&0\\0&1\end{pmatrix}, U^T=\begin{pmatrix}\frac{1}{\sqrt{2}}&-\frac{1}{\sqrt{2}}\\\frac{1}{\sqrt{2}}&\frac{1}{\sqrt{2}}\end{pmatrix}$.

Find A^5

- Correct! $\begin{pmatrix}-121&122\\122&-121\end{pmatrix}$
- $\begin{pmatrix}-1&32\\32&-1\end{pmatrix}$
- $\begin{pmatrix}-1&2\\2&-1\end{pmatrix}$
- $\begin{pmatrix}1&32\\32&1\end{pmatrix}$

$A=U\Lambda U^{-1}$, $\Lambda=\begin{pmatrix}-3&\\&1\end{pmatrix}$

$A^5=(U\Lambda U^{-1})(U\Lambda U^{-1})\cdots=\begin{pmatrix}(-3)^5&\\&1\end{pmatrix}$

Question 6 — 1 / 1 pts

Consider the eigendecomposition of A written as $U\Lambda U^T$.

Which of the following is **Not** always true?

- All of the other statements are true
- Correct!
  The singular value decomposition is unique.
  i.e. A cannot be equal to the product of a different orthogonal matrix, diagonal matrix and orthogonal matrix
- $\text{rank}(A)=\text{rank}(\Lambda)$ ✗ $A=U\Lambda U^{-1}=\Lambda$ full rank
- U^T is the eigenvectors of A^TA ✗ right singular vector

Question 7 — 1 / 1 pts

Suppose $AB=BA$, which of the following would **NOT** be possible?

- $B=A^{-1}$

- A=B
- Correct! All are possible
- A and B are diagonal

Question 8 — 1 / 1 pts

Given $A\in\mathbb{R}^{m\times n}$ and $B\in\mathbb{R}^{l\times m}$, if AC^TB is well-defined, what are the dimension of C?

- $m\times m$
- $n\times l$
- $m\times n$
- Correct! $l\times n$

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