Homework Quiz 8

Due 17 Nov at 6:00 **Points** 130 **Questions** 13
Available 10 Nov at 6:00 - 17 Nov at 6:00 **Time limit** None

This quiz was locked 17 Nov at 6:00.

Attempt history

	Attempt	Time	Score
LATEST	Attempt 1	4,982 minutes	130 out of 130

Score for this quiz: **130** out of 130
Submitted 17 Nov at 3:07
This attempt took 4,982 minutes.

Question 1

10 / 10 pts

Let $\mathbf{v_1} = \begin{bmatrix} -3 \\ 0 \\ 6 \end{bmatrix}$, $\mathbf{v_2} = \begin{bmatrix} -2 \\ 2 \\ 3 \end{bmatrix}$, $\mathbf{v_3} = \begin{bmatrix} 0 \\ -6 \\ 3 \end{bmatrix}$ and $\mathbf{p} = \begin{bmatrix} 1 \\ 14 \\ -9 \end{bmatrix}$.

Determine if $\mathbf{p}$ is in $\operatorname{Col} A$, where $A = [\,\mathbf{v}_1 \quad \mathbf{v}_2 \quad \mathbf{v}_3\,]$.

Correct!

- Yes, $\mathbf{p}$ is in $\operatorname{Col} A$.
- No, $\mathbf{p}$ is not in $\operatorname{Col} A$.

Question 2

10 / 10 pts

With $\mathbf{u} = \begin{bmatrix} -2 \\ 3 \\ 1 \end{bmatrix}$ and $A = [\mathbf{v}_1 \quad \mathbf{v}_2 \quad \mathbf{v}_3]$ where $\mathbf{v}_1 = \begin{bmatrix} -3 \\ 0 \\ 6 \end{bmatrix}$, $\mathbf{v}_2 = \begin{bmatrix} -2 \\ 2 \\ 3 \end{bmatrix}$, $\mathbf{v}_3 = \begin{bmatrix} 0 \\ -6 \\ 3 \end{bmatrix}$, determine if $\mathbf{u}$ is in $\mathrm{Nul}\, A$.

Correct!

- (selected) Yes, $\mathbf{u}$ is in $\mathrm{Nul}\, A$.
- No, $\mathbf{u}$ is not in $\mathrm{Nul}\, A$.

Question 3

10 / 10 pts

Mark all sets of vectors below that form a basis for $\mathbb{R}^2$ or $\mathbb{R}^3$. (Careful here; reread the definition of a basis.)

- [ ] $\left\{ \begin{bmatrix} -4 \\ 6 \end{bmatrix}, \begin{bmatrix} 2 \\ -3 \end{bmatrix} \right\}$

Correct!

- [x] $\left\{ \begin{bmatrix} 1 \\ 1 \\ -2 \end{bmatrix}, \begin{bmatrix} -5 \\ -1 \\ 2 \end{bmatrix}, \begin{bmatrix} 7 \\ 0 \\ -5 \end{bmatrix} \right\}$
- [ ] $\left\{ \begin{bmatrix} 1 \\ -6 \\ -7 \end{bmatrix}, \begin{bmatrix} 3 \\ -4 \\ 7 \end{bmatrix}, \begin{bmatrix} -2 \\ 7 \\ 5 \end{bmatrix}, \begin{bmatrix} 0 \\ 8 \\ 9 \end{bmatrix} \right\}$

Question 4

10 / 10 pts

Select all the statements that are true.

- [ ] A subset H of $\mathbb{R}^n$ is a subspace if the zero vector is in H.

Correct!

- [x] Given vectors $\mathbf{v}_1, \dots, \mathbf{v}_p$ in $\mathbb{R}^n$, the set of all linear combinations of these vectors is a subspace of $\mathbb{R}^n$.

Correct!

- [x] The null space of an $m \times n$ matrix is a subspace of $\mathbb{R}^n$.
- [ ] The column space of a matrix A is the set of solutions of $A\mathbf{x} = \mathbf{b}$.
- [ ] If B is an echelon form of matrix A, then the pivot columns of B form a basis for $\text{Col } A$.

Question 5

10 / 10 pts

Suppose that A is a $n \times n$ matrix whose columns are linearly independent. Select all the statements that are true.

Correct!

- [x] $\text{Col } A = \mathbb{R}^n$.

Correct!

- [x] $\text{Nul } A = \{\mathbf{0}\}$.

Correct!

- [x] $\text{rank } A = n - \dim \text{Nul } A$.

Correct!

- [x] $\text{rank } A = n$.

Correct!

- [x] $\dim \text{Nul } A = 0$.

Question 6

10 / 10 pts

Select all the statements that are true. Here A is an $m \times n$ matrix.

Correct!

If $B = \{\mathbf{v}_1, \ldots, \mathbf{v}_p\}$ is a basis for a subspace H and if $\mathbf{x} = c_1\mathbf{v}_1 + \cdots + c_p\mathbf{v}_p$, then $c_1, \ldots, c_p$ are the coordinates of $\mathbf{x}$ relative to the basis B.

Each line in $\mathbb{R}^n$ is a one-dimensional subspace of $\mathbb{R}^n$.

Correct!

The dimension of $\mathrm{Col}\ A$ is the number of pivot columns in A.

Correct!

The dimensions of $\mathrm{Col}\ A$ and $\mathrm{Nul}\ A$ add up to the number of columns in A.

Correct!

If a set of p vectors spans a p - dimensional subspace H of $\mathbb{R}^n$, then these vectors form a basis for H.

Question 7

10 / 10 pts

Select all the statements that are true for a $m \times n$ matrix called A.

Correct!

If B is a basis for a subspace H, then each vector in H can be written in only one way as a linear combination of the vectors in B.

The dimension of $\mathrm{Nul}\ A$ is the number of variables in the equation $A\mathbf{x} = \mathbf{0}$.

Correct!

The dimension of the column space of A is $\mathrm{rank}\ A$.

Correct!

If H is a p - dimensional subspace of $\mathbb{R}^n$, then a linearly independent set of p vectors in H is a basis for H.

Question 8

10 / 10 pts

Let $\mathbf{b}_1 = \begin{bmatrix} 1 \\ -3 \\ 0 \end{bmatrix}$, $\mathbf{b}_2 = \begin{bmatrix} -3 \\ 5 \\ 0 \end{bmatrix}$ and $\mathbf{x} = \begin{bmatrix} -7 \\ 5 \\ 0 \end{bmatrix}$.

The vector $\mathbf{x}$ is in a subspace H with a basis $B = [\mathbf{b}_1 \quad \mathbf{b}_2]$. Find the B - coordinate vector of $\mathbf{x}$.

Correct!

- ◉ $[\mathbf{x}]_B = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$
- ○ $[\mathbf{x}]_B = \begin{bmatrix} -22 \\ 46 \end{bmatrix}$
- ○ $[\mathbf{x}]_B = \begin{bmatrix} -7 \\ 5 \end{bmatrix}$
- ○ The problem does not provide sufficient information to answer this question.

Question 9

10 / 10 pts

If the subspace of all solutions of $A\mathbf{x} = \mathbf{0}$ has a basis consisting of three vectors and if A is a 5×7 matrix, what is the rank of A?

- ○ 5
- ○ 7

Correct!

- ◉ 4
- ○ 2

Question 10

10 / 10 pts

If the rank of a 9×8 matrix A is 7, what is the dimension of the solution space of $A\mathbf{x} = \mathbf{0}$?

- 9
- 8
- 2
- Correct! 1

Question 11

10 / 10 pts

Let $A = \begin{bmatrix} 1 & -2 & 9 & 5 & 4 \\ 1 & -1 & 6 & 5 & -3 \\ -2 & 0 & -6 & 1 & -2 \\ 4 & 1 & 9 & 1 & -9 \end{bmatrix}$ with row reduced echelon form

$U = \begin{bmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & -3 & 0 & -7 \\ 0 & 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$.

We denote the columns of A by $\mathbf{a}_1, \ldots, \mathbf{a}_5$ such that $A = [\mathbf{a}_1 \quad \mathbf{a}_2 \quad \mathbf{a}_3 \quad \mathbf{a}_4 \quad \mathbf{a}_5]$ and the columns of U by $\mathbf{u}_1, \ldots, \mathbf{u}_5$ such that $U = [\mathbf{u}_1 \quad \mathbf{u}_2 \quad \mathbf{u}_3 \quad \mathbf{u}_4 \quad \mathbf{u}_5]$.

Mark all correct statements below.

- A basis for $\mathrm{Col}\, A$ is $\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_4\}$.
- Correct! A basis for $\mathrm{Col}\, A$ is $\{\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_4\}$.

A basis for $\mathrm{Col}\ A$ is $\{\mathbf{a}_3, \mathbf{a}_5\}$.

A basis for $\mathrm{Col}\ A$ is $\{\mathbf{u}_3, \mathbf{u}_5\}$.

A basis for $\mathrm{Nul}\ A$ is $\{\mathbf{a}_3, \mathbf{a}_5\}$.

A basis for $\mathrm{Nul}\ A$ is $\{\mathbf{u}_3, \mathbf{u}_5\}$.

Correct!

The basis for $\mathrm{Nul}\ A$ is something else.

Question 12

10 / 10 pts

Given the following vectors,

$$\begin{bmatrix} 1 \\ -1 \\ -2 \\ 5 \end{bmatrix}, \begin{bmatrix} 2 \\ -3 \\ -1 \\ 6 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ -6 \\ 8 \end{bmatrix}, \begin{bmatrix} -1 \\ 4 \\ -7 \\ 7 \end{bmatrix}, \begin{bmatrix} 3 \\ -8 \\ 9 \\ -5 \end{bmatrix},$$

What is the dimension of the subspace spanned by these vectors? (Remember that subspace dimension and vector dimension are two different concepts.)

Correct!

2

orrect Answers

Between 2 and 2

Question 13

10 / 10 pts

Consider a matrix A that has reduced echelon form:

$$U = \begin{bmatrix} 1 & 4 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

Which set of vectors forms a basis for the column space of A?

- $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 4 \\ 0 \\ 0 \end{bmatrix}$
- $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$
- $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$

Correct!

- The problem does not provide sufficient information to answer this question.

Quiz score: **130** out of 130