

Homework Quiz 9

Due 1 Dec at 6:00

Points 150

Questions 15

Available 17 Nov at 6:00 - 1 Dec at 6:00

Time limit None

This quiz was locked 1 Dec at 6:00.

Attempt history

	Attempt	Time	Score
LATEST	Attempt 1	15,050 minutes	150 out of 150

Score for this quiz: **150** out of 150

Submitted 1 Dec at 2:56

This attempt took 15,050 minutes.

Question 1

10 / 10 pts

The vectors $\mathbf{u} = \begin{bmatrix} 4 \\ 3 \\ -3 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} 6 \\ -3 \\ 5 \end{bmatrix}$ are orthogonal.

Correct!

☒ True

☐ False

Question 2

10 / 10 pts

The vectors $\mathbf{y} = \begin{bmatrix} -3 \\ 7 \\ 4 \\ 0 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} 1 \\ -8 \\ 15 \\ -7 \end{bmatrix}$ are orthogonal.

Correct!

☐ True

☒ False

Question 3

10 / 10 pts

The vectors $\begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}$, $\begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$, $\begin{bmatrix} -5 \\ -2 \\ 1 \end{bmatrix}$ form an orthogonal set.

Correct!

☒ True

☐ False

Question 4

10 / 10 pts

The vectors $\begin{bmatrix} 5 \\ -4 \\ 0 \\ 3 \end{bmatrix}$, $\begin{bmatrix} -4 \\ 1 \\ -3 \\ 8 \end{bmatrix}$, $\begin{bmatrix} 3 \\ 3 \\ 5 \\ -1 \end{bmatrix}$ form an orthogonal set.

☐ True

Correct!

☒ False

Question 5

10 / 10 pts

If a set $S = \{\mathbf{u}_i, \dots, \mathbf{u}_p\}$ has the property that $\mathbf{u}_i \cdot \mathbf{u}_j = 0$ whenever $i \neq j$, then S is an **orthonormal** set.

Correct!

☐ True

☒ False

Question 6

10 / 10 pts

If the columns of an $m \times n$ matrix A are orthonormal, then $A'A = I$.

Correct!

☒ True

☐ False

Question 7

10 / 10 pts

An orthogonal matrix is invertible.

Correct!

☒ True

☐ False

Question 8

10 / 10 pts

What is the orthogonal projection of $\mathbf{y} = \begin{bmatrix} 6 \\ 3 \\ -2 \end{bmatrix}$ onto the space spanned

by $\mathbf{u}_1 = \begin{bmatrix} 3 \\ 4 \\ 0 \end{bmatrix}$ and $\mathbf{u}_2 = \begin{bmatrix} -4 \\ 3 \\ 0 \end{bmatrix}$?

Correct!

☐ $\begin{bmatrix} -6.6 \\ 1.2 \\ 0 \end{bmatrix}$

☐ $\begin{bmatrix} 6 \\ 3 \\ -2 \end{bmatrix}$

☒ $\begin{bmatrix} 6 \\ 3 \\ 0 \end{bmatrix}$

☐ $\begin{bmatrix} 150 \\ 75 \\ 0 \end{bmatrix}$

Question 9

10 / 10 pts

What is the closest point to $\mathbf{y} = \begin{bmatrix} 3 \\ -1 \\ 1 \\ 13 \end{bmatrix}$ in the subspace W spanned by

$\mathbf{v}_1 = \begin{bmatrix} 1 \\ -2 \\ -1 \\ 2 \end{bmatrix}$ and $\mathbf{v}_2 = \begin{bmatrix} -4 \\ 1 \\ 0 \\ 3 \end{bmatrix}$?

☐ $\begin{bmatrix} -74 \\ -34 \\ -30 \\ 138 \end{bmatrix}$

Correct!

☒ $\begin{bmatrix} -1 \\ -5 \\ -3 \\ 9 \end{bmatrix}$

☐ $\begin{bmatrix} -11 \\ 1 \\ -1 \\ 11 \end{bmatrix}$

☐ $\begin{bmatrix} -0.4111 \\ -0.1889 \\ -0.1667 \\ 0.7667 \end{bmatrix}$

Question 10

10 / 10 pts

Which of the following collections of vectors is an orthogonal basis for the column space of the matrix:

$$\begin{bmatrix} 1 & 3 & 5 \\ -1 & -3 & 1 \\ 0 & 2 & 3 \\ 1 & 5 & 2 \\ 1 & 5 & 8 \end{bmatrix} ?$$

Mark all correct choices.

Correct!

☒ $\begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 1 \\ 2 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \\ -1 \\ 1 \end{bmatrix}$

☐ $\begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 3 \\ -3 \\ 2 \\ 5 \\ 5 \end{bmatrix}, \begin{bmatrix} 5 \\ 1 \\ 3 \\ 2 \\ 8 \end{bmatrix}$

☐

$$\begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 1 \\ 2 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ -2 \\ 3 \\ 5 \\ 5 \end{bmatrix}$$

Correct!

☒

$$\begin{bmatrix} 1 \\ -1 \\ 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 1 \\ 2 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 3 \\ 3 \\ 0 \\ -3 \\ 3 \end{bmatrix}$$

Question 11

10 / 10 pts

Which answer describes the parametric vector form of all possible least squares solutions to $A\mathbf{x} = \mathbf{b}$ when

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix} \text{ and } \mathbf{b} = \begin{bmatrix} 7 \\ 2 \\ 3 \\ 6 \\ 5 \\ 4 \end{bmatrix} ?$$

☐

$$\begin{bmatrix} 5 \\ -1 \\ 0 \end{bmatrix}$$

Correct!

☒

$$\begin{bmatrix} 5 \\ -1 \\ 0 \end{bmatrix} + c \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}$$

☐

$$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} + c \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

☐

$$\begin{bmatrix} 5 \\ -1 \\ 0 \end{bmatrix} + c \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$$

Question 12

10 / 10 pts

If vector \mathbf{b} is in the column space of \mathbf{A} , then every solution of $\mathbf{Ax} = \mathbf{b}$ is a least-squares solution.

Correct!

☒ True

☐ False

Question 13

10 / 10 pts

The least-squares solution of $\mathbf{Ax} = \mathbf{b}$ is the point in the column space of \mathbf{A} closest to \mathbf{b} .

Correct!

☐ True

☒ False

Question 14

10 / 10 pts

A least-squares solution of $\mathbf{Ax} = \mathbf{b}$ is a list of weights that, when applied to the columns of \mathbf{A} , produces the orthogonal projection of \mathbf{b} onto $\text{Col } \mathbf{A}$.

Correct!

☒ True

☐ False

Question 15**10 / 10 pts**

If $\hat{\mathbf{x}}$ is a least-squares solution of $A\mathbf{x} = \mathbf{b}$, then the equation $\hat{\mathbf{x}} = (A^T A)^{-1} A^T \mathbf{b}$ always holds.

☐ True

☒ False

Correct!Quiz score: **150** out of 150