Exam #2

ⓘ This is a preview of the published version of the quiz

Started: Feb 8 at 11:21pm

Quiz Instructions

Exam #2

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The following is Exam #2. You will have until 2:45 pm to complete this exam. The due time for the exam may be extended, so please do not stress if you are not finished and 2:45 pm approaches.

Please complete this exam on separate paper or on a tablet. Clearly indicate the question number for each question. Please show all work and clearly indicate your answers. Remember, this exam is an opportunity for you to demonstrate what you know. Please work on this exam on your own. You are not allowed to use your textbook, collaborate, nor allowed to use any external websites for assistance. You may use a calculator on this exam. Once you complete this exam, please submit a pdf of your exam to Canvas.

Once you complete the exam, please click on "Submit". You will not submit the exam to this assignment. You will submit your exam through the "**Exam #2 Submission Assignment**" in Canvas under **Assignments**. You can use a device to scan your exam. Please note that once your click Submit on this part of the exam and use your phone, you may not continue to work on your exam. If using paper, scan in your exam using Adobe Scan or any other scanning app.

You may only submit your exam once through the submission assignment. Submission times may be checked with when you log off Zoom and/or when you submit this part of the exam.

For this exam, you must keep your camera on for proctoring purposes. You will be placed into an individual breakout room. If you have any questions during the exam, you can click on the "Ask for Help" button and I will be with you as soon as possible.

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1. Determine the inverse of the following elementary matrices:

(2 points) a. $\begin{bmatrix} 1 & 0 & 4 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(2 points) b. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & \frac{1}{3} \end{bmatrix}$

(2 points) c. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(8 points) 2. Use elementary row operations to find $\det A$.

$$A = \begin{bmatrix} 4 & -7 & 9 & 1 \\ 6 & 2 & 7 & 0 \\ 3 & 6 & -3 & 3 \\ 0 & 7 & 4 & -1 \end{bmatrix}$$

(6 points) 3. Use cofactors to find $\det(A)$.

$$A = \begin{bmatrix} 3 & 8 & -7 \\ 0 & -5 & 4 \\ 8 & 1 & 6 \end{bmatrix}$$

4. Given the following matrix: $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & -1 \\ 2 & 2 & 2 \end{bmatrix}$

(6 points) a. Find $\operatorname{adj}(A)$.

(3 points) b. Find $\det(A)$.

(5 points) 5. Use Cramer's Rule to solve the following system of equations.

$$18x_1 + 12x_2 = 13$$
$$30x_1 + 24x_2 = 23$$

6. Given the following vectors: $\vec{u} = (3, 5, -2)$ and $\vec{v} = (7, -4, 3)$. Determine the following:

(2 points) a. $4\vec{u} - 5\vec{v}$

(2 points) b. $2(3\vec{u} + 4\vec{v})$

7. Given that A and B are 3×3 matrices, and that $\det(A) = 4$ and $\det(B) = 2$. Determine the following:

(2 points) a. $\det(AB)$

(2 points) b. $\det(3B)$

(2 points) c. $\det(A^T)$

(2 points) d. $\det(B^{-1})$

(2 points) e. $\det(A^2)$

(2 points) f. If matrix C is the result of performing $R_1 \leftrightarrow R_3$ to matrix B, find $\det(C)$.

(2 points) g. If matrix D is the result of performing $5R_1 + R_2 \rightarrow R_2$ to matrix A, find $\det(D)$.

(2 points) h. If matrix F is the result of performing $4R_2$ to matrix B, find $\det(F)$.

8. Explain why the following sets are not vector spaces.

(4 points) a. $V = \{(1, b, c) | b, c \in \mathbb{R}\}$, together with the standard operations of vector addition and scalar multiplication.

(4 points) b. $\mathbb{Q}$ = The set of all rational numbers, together with the usual operations of addition and scalar multiplication.

(4 points) c. The set of all polynomials of degree exactly 3, together with the standard operations of polynomial addition and scalar multiplication.

(5 points) 10. Show that for any vector $\vec{u} = (u_1, u_2, u_3)$ in $\mathbb{R}^3$ and any two scalars c and d, $(c + d)\vec{u} = c\vec{u} + d\vec{u}$.

(5 points) 11. Given the set $V = \left\{ \begin{bmatrix} a & 0 \\ b & c \end{bmatrix} \middle| a, b, c \in \mathbb{R} \right\}$. Show that for any two 2×2 matrices of the form $A = \begin{bmatrix} a_1 & 0 \\ b_1 & c_1 \end{bmatrix}$ and $B = \begin{bmatrix} a_2 & 0 \\ b_2 & c_2 \end{bmatrix}$, that $A + B = B + A$.

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