MATH 265: PRACTICE EXAM I

Name ____________________ Student # ____________________

Answer	Points awarded
1. (10 points) __________	__________
2. (10 points) __________	__________
3. (10 points) __________	__________
4. (10 points) __________	__________
5. (10 points) __________	__________
6. (10 points) __________	__________
7. (10 points) __________	__________
8. (10 points) __________	__________
9. (10 points) __________	__________
10. (10 points) __________	__________
11. (10 points) __________	__________
12. (10 points) __________	__________
	Total Points: __________

1. If

$$\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} a & 1 \\ 0 & b \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix},$$

then

A. $a = 1, b = 1$

B. $a = 0, b = 1$

C. $a = 0, b = -1$

D. $a = 2, b = 0$

E. $a = 2, b = 1$

Correct ans is D.

2. Which of the following matrices is in row echelon form?

i. $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$

ii. $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$

iii. $\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$

iv. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$

A. (i) and (ii)

B. (i) and (iii)

C. (ii) and (iii) only

D. (ii) and (iv)

E. (iv) only

Correct ans is A.

3. Determine all the values of a for which the system is inconsistent.

$$\begin{aligned} x + y - z &= 2 \\ -x - 2y + 2z &= 3 \\ x + y + (a^2 - 5)z &= a \end{aligned}$$

A. $a = 2$ only.

B. $a = -2$ only.

C. $a \neq 2$ or $a \neq -2$.

D. $a = 2$ or $a = -2$.

E. None of the above.

Correct ans is B.

4. The matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is nonsingular if and only if

A. $a \neq 0$ and $b \neq 0$

B. $ad - bc \neq 0$

C. $a = b = c = d = 1$

D. $ad - bc = 0$

E. $a = b = c = d$

Correct ans is B.

5. If the system

$$\begin{aligned} x + 2y - 3z &= a \\ 2x + 3y + z &= b \\ 5x + 9y - 8z &= c \end{aligned}$$

is consistent, what can we conclude about a, b and c?

A. $3a - b + c = 0$.

B. $a - 3b + c = 0$.

C. $3a + b - c = 0$.

D. $3a - b - c = 0$

E. $a + 3b - c = 0$

Correct ans is C.

6. Find all the values of a such that

$$A = \begin{bmatrix} 0 & 1 & a \\ 1 & 3 & 5 \\ a & 2 & a \end{bmatrix}$$

is singular.

A. $a = -1$ and $a = 0$.

B. $a = 0$ and $a = -2$.

C. $a = 0$ and $a = 2$.

D. $a = 2$.

E. $a = 0$ and $a = 1$.

Correct ans is C.

7. Evaluate the determinant

$$\begin{vmatrix} 1 & 1 & 0 & 2 \\ 0 & 1 & 0 & -1 \\ 3 & 2 & 4 & 0 \\ 0 & 3 & 0 & 2 \end{vmatrix}.$$

A. 6

B. -4

C. -12

D. 4

E. 20

Correct ans is E.

8. Which of the following matrices is adjoint to

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

A.

$$\begin{bmatrix} 2 & -3 & -6 \\ 1 & 0 & 0 \\ 1 & 0 & 3 \end{bmatrix}.$$

B.

$$\begin{bmatrix} -2 & -3 & 6 \\ 1 & 0 & 0 \\ -1 & 0 & -3 \end{bmatrix}.$$

C.

$$\begin{bmatrix} -2 & 3 & 6 \\ -1 & 0 & 0 \\ -1 & 0 & 3 \end{bmatrix}.$$

D.

$$\begin{bmatrix} -2 & 1 & -1 \\ -3 & 0 & 0 \\ 6 & 0 & -3 \end{bmatrix}.$$

E.

$$\begin{bmatrix} -2 & -1 & -1 \\ 3 & 0 & 0 \\ 6 & 0 & -3 \end{bmatrix}.$$

Correct ans is C.

9. Let A be an $n \times n$ invertible matrix. Which of the following statements are true?

i. $A^\top$ is singular.

ii. $A\mathbf{x} = \mathbf{0}$ has infinitely many solutions.

iii. A is row equivalent to the identity matrix.

iv. $A\mathbf{x} = \mathbf{b}$ has a unique solution for every $n \times 1$ matrix $\mathbf{b}$.

v. $\det(A) = 0$.

A. (i) and (iii).
B. (ii) and (v).
C. (iii) only.
D. (iii) and (iv).
E. (v) only.

Correct ans is D.

10. Which of the following statements about all 5×5 matrices is **true**?

A. $\det(A - B) = \det A - \det B$
B. $\det(-A) = \det(A)$.
C. $\det A^\top = \det(A)$.
D. $AB = AC$ implies $B = C$.
E. $AB = 0$ implies $A = 0$ or $B = 0$.

Correct ans is C.

11. Let V be the set of positive real numbers. Let the definition of vector addition be $\mathbf{u} \oplus \mathbf{v} = \mathbf{uv}$ for every $\mathbf{u}$ and $\mathbf{v}$ in V and the definition of multiplication by a scalar be $c \odot \mathbf{u} = \mathbf{u}^c$ for every real number c and every $\mathbf{u}$ in V. Which statement below is **not** true?

A. V is closed under vector addition.

B. V is closed under scalar multiplication.

C. The vector addition is commutative: $\mathbf{u} \oplus \mathbf{v} = \mathbf{v} \oplus \mathbf{u}$ for every $\mathbf{u}$ and $\mathbf{v}$ in V.

D. It is true that $1 \odot \mathbf{u} = \mathbf{u}$ for every $\mathbf{u}$ in V.

E. It is true that $0 \odot \mathbf{u} = 0$ for every $\mathbf{u}$ in V.

Correct ans is E.

12. Which of the following subsets of $\mathbb{R}^2$ with the usual vector addition and scalar multiplication are subspaces?

i. W_1 is the set of all vectors of the form $\begin{bmatrix} x \\ y \end{bmatrix}$, where $x \leq 0$.

ii. W_2 is the set of all vectors of the form $\begin{bmatrix} x \\ y \end{bmatrix}$, where $y \geq 0$

iii. W_3 is the set of all vectors of the form $\begin{bmatrix} x \\ y \end{bmatrix}$, where $y = 0$

A. W_1 only.

B. W_2 only.

C. W_3 only.

D. W_1 and W_2.

E. None of them.

Correct ans is C.