Determinants

1. What is the determinant of \[
\begin{bmatrix}
5 & 4 \\
1 & 3
\end{bmatrix}
\]?

(a) 4  
(b) 11  
(c) 15  
(d) 19

2. What is the determinant of \[
\begin{bmatrix}
5 & 1 & 0 \\
1 & 3 & 2 \\
0 & -1 & 1
\end{bmatrix}
\]?

(a) 0  
(b) 15  
(c) 24  
(d) 26

3. What is the determinant of \[
\begin{bmatrix}
5 & 0 & 0 \\
0 & 3 & 0 \\
0 & 0 & 1
\end{bmatrix}
\]?

(a) 0  
(b) 9  
(c) 15

4. What is the determinant of \[
\begin{bmatrix}
5 & 2 & -1 \\
0 & 3 & 4 \\
0 & 0 & 1
\end{bmatrix}
\]?

(a) 0  
(b) 6  
(c) 15  
(d) 22
5. Which of the following matrices are not invertible?

(a) \[
\begin{bmatrix}
2 & -3 \\
3 & 2
\end{bmatrix}
\]

(b) \[
\begin{bmatrix}
-2 & 3 \\
2 & 3
\end{bmatrix}
\]

(c) \[
\begin{bmatrix}
3 & -3 \\
-2 & 2
\end{bmatrix}
\]

(d) \[
\begin{bmatrix}
3 & -3 & 3 \\
-2 & 2 & -2 \\
0 & 0 & 0
\end{bmatrix}
\]

(e) More than one of the above

(f) All of the above have inverses

6. **True or False** \( \det(A + B) = \det A + \det B \). Be prepared to support your answer either with a proof (at least for the \( 2 \times 2 \) case) or a counterexample.

(a) True, and I am very confident

(b) True, but I am not very confident

(c) False, but I am not very confident

(d) False, and I am very confident

7. **True or False** \( \det(AB) = \det A \det B \). Be prepared to support your answer either with a proof (at least for the \( 2 \times 2 \) case) or a counterexample.

(a) True, and I am very confident

(b) True, but I am not very confident

(c) False, but I am not very confident

(d) False, and I am very confident

8. Suppose the determinant of a \( 2 \times 2 \) matrix \( A \) is equal to 3. What is the determinant of \( A^{-1} \)?

(a) \( \frac{1}{3} \)

(b) 3

(c) 9

(d) Not enough information is given.
9. Suppose the determinant of a $2 \times 2$ matrix $A$ is equal to 3. What is the determinant of $5A$?

(a) 3  
(b) 9  
(c) 15  
(d) 75  
(e) Not enough information is given.

10. If $A$ is a $2 \times 2$ matrix, then $\det(kA)$ is

(a) $k \det(A)$  
(b) $2k \det(A)$  
(c) $k^2 \det(A)$  
(d) Not enough information is given.

11. Which of the following statements is true?

(a) If a square matrix has two identical rows then its determinant is zero.  
(b) If the determinant of a matrix is zero, then the matrix has two identical rows.  
(c) Both are true.  
(d) Neither is true.

12. Suppose the determinant of matrix $A$ is zero. How many solutions does the system $Ax = b$ have?

(a) 0  
(b) 1  
(c) Infinite  
(d) Not enough information is given.

13. Suppose the determinant of matrix $A$ is zero. How many solutions does the system $Ax = 0$ have?

(a) 0  
(b) 1  
(c) Infinite  
(d) Not enough information is given.