

# 第1章 行列式

## A 组



1. 排列 123ijk689 是偶排列,那么  $i, j, k$  分别为( ).

(A)  $i = 4, j = 5, k = 7$

(B)  $i = 4, j = 7, k = 5$

(C)  $i = 7, j = 4, k = 5$

(D)  $i = 5, j = 7, k = 4$

2.  $\begin{vmatrix} 1 & 3 & 9 & 27 \\ 1 & -1 & 1 & -1 \\ 2 & 4 & 8 & 16 \\ 1 & -2 & 4 & -8 \end{vmatrix} = ( \quad ).$

(A) 240

(B) 480

(C) -240

(D) -480

3. 多项式  $f(x) = \begin{vmatrix} x & 2x & -x & 1 \\ 2 & 1 & 0 & 0 \\ 1 & 0 & -1 & 0 \\ -2 & 0 & 0 & 2 \end{vmatrix}$  的常数项是( ).

(A) 1

(B) -2

(C) 3

(D) 4

4. 设  $\begin{vmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{vmatrix} = m, c \neq 0$ , 则  $\begin{vmatrix} a_{11} & a_{12}c & a_{13}c^2 & a_{14}c^3 \\ a_{21}c^{-1} & a_{22} & a_{23}c & a_{24}c^2 \\ a_{31}c^{-2} & a_{32}c^{-1} & a_{33} & a_{34}c \\ a_{41}c^{-3} & a_{42}c^{-2} & a_{43}c^{-1} & a_{44} \end{vmatrix} = ( \quad ).$

(A)  $c^{-2}m$

(B)  $m$

(C)  $cm$

(D)  $c^3m$

5. 行列式  $\begin{vmatrix} a_1 & a_2 & \cdots & a_n & 0 \\ 1 & 0 & \cdots & 0 & b_1 \\ 0 & 1 & \cdots & 0 & b_2 \\ \vdots & \vdots & & \vdots & \vdots \\ 0 & 0 & \cdots & 1 & b_n \end{vmatrix}$  的值为( ).

(A)  $\sum_{i=1}^n a_i b_i$

(B)  $-\sum_{i=1}^n a_i b_i$

(C)  $(-1)^n \sum_{i=1}^n a_i b_i$

(D)  $(-1)^{n+1} \sum_{i=1}^n a_i b_i$

6. 设  $A$  是  $n(n \geq 2)$  阶方阵,  $|A| = 3$ , 则  $|(A^*)^*| = ( \quad ).$

(A)  $3^{(n-1)^2}$

(B)  $3^{n^2-1}$

(C)  $3^{n^2-n}$

(D)  $3^{n-1}$



7. 设  $a, b, a+b$  均非零, 则行列式  $\begin{vmatrix} a & b & a+b \\ b & a+b & a \\ a+b & a & b \end{vmatrix} = \underline{\hspace{2cm}}.$

8. 行列式  $D_5 = \begin{vmatrix} 0 & 0 & 0 & x & y \\ 0 & 0 & x & y & 0 \\ 0 & x & y & 0 & 0 \\ x & y & 0 & 0 & 0 \\ y & 0 & 0 & 0 & x \end{vmatrix} = \underline{\hspace{2cm}}.$

9. 行列式  $\begin{vmatrix} 1 & 1 & 1 & 1+x \\ 1 & 1 & 1-x & 1 \\ 1 & 1+y & 1 & 1 \\ 1-y & 1 & 1 & 1 \end{vmatrix} = \underline{\hspace{2cm}}.$

10. 行列式  $\begin{vmatrix} 1-x & x & 0 & 0 & 0 \\ -1 & 1-x & x & 0 & 0 \\ 0 & -1 & 1-x & x & 0 \\ 0 & 0 & -1 & 1-x & x \\ 0 & 0 & 0 & -1 & 1-x \end{vmatrix} = \underline{\hspace{2cm}}.$

11. 设  $A, B$  都是 3 阶矩阵, 若  $|A| = -3, |B| = 4, C = \begin{bmatrix} 2A^* & (AB)^* \\ O & B^{-1} \end{bmatrix}$ , 则  $|C| = \underline{\hspace{2cm}}.$

12. 设 3 阶矩阵  $A$  的伴随矩阵为  $A^*$ , 且  $|A| = \frac{1}{2}$ , 则  $|A^{-1} + 2A^*| = \underline{\hspace{2cm}}.$

13. 设  $\alpha_1, \alpha_2, \alpha_3$  是 3 维列向量,  $A = [\alpha_1, \alpha_2, \alpha_3], B = [2\alpha_1 + \alpha_2, 2\alpha_2 - \alpha_1, 3\alpha_3 + \alpha_1]$ , 若  $|B - A| = 16$ , 则  $|2A^*| = \underline{\hspace{2cm}}.$

## B 组



1.  $n$  阶行列式  $D_n = \begin{vmatrix} 0 & 0 & \cdots & 0 & a & b \\ 0 & 0 & \cdots & a & b & 0 \\ \vdots & \vdots & & \vdots & \vdots & \vdots \\ a & b & \cdots & 0 & 0 & 0 \\ b & 0 & \cdots & 0 & 0 & a \end{vmatrix}$  的值为( ).

(A)  $(-1)^{\frac{n^2-n}{2}} a^n + (-1)^{\frac{n^2+n}{2}} b^n$

(B)  $(-1)^{\frac{n^2+n+2}{2}} a^n + (-1)^{\frac{n^2+n}{2}} b^n$

(C)  $(-1)^{\frac{n^2-n+4}{2}} a^n + (-1)^{\frac{n^2-3n+2}{2}} b^n$

(D)  $(-1)^{\frac{n^2-3n+2}{2}} a^n + (-1)^{\frac{n^2-n+4}{2}} b^n$

2. 设  $f(x) = \begin{vmatrix} x & a_1 & a_2 & \cdots & a_n \\ a_1 & x & a_2 & \cdots & a_n \\ a_1 & a_2 & x & \cdots & a_n \\ \vdots & \vdots & \vdots & & \vdots \\ a_1 & a_2 & a_3 & \cdots & x \end{vmatrix}$  ( $a_1, a_2, \dots, a_n$  为互不相同的正实数,  $n > 2$ ), 则方程



$f'(x)=0$  的实根个数为( ).

- (A)1 (B) $n-1$  (C) $n$  (D) $n+1$

3. 设  $\alpha_1, \alpha_2, \dots, \alpha_n$  是  $n$  维列向量,  $A = [\alpha_1, \alpha_2, \dots, \alpha_n]$ ,  $B = [\alpha_n, \alpha_1, \alpha_2, \dots, \alpha_{n-1}]$ . 若  $|A| = 1$ , 则  $|A-B| = ( )$ .

- (A) $1+(-1)^n$  (B) $1+(-1)^{n+1}$  (C) $(-1)^n$  (D)0

4. 设  $A$  是 3 阶方阵, 满足  $|3A+2E|=0$ ,  $|A-E|=0$ ,  $|3E-2A|=0$ , 则  $|A| = ( )$ .

- (A)2 (B)1 (C)-1 (D)-2

5.  $n$  阶行列式 
$$\begin{vmatrix} a_1-b & a_2 & \cdots & a_n \\ a_1 & a_2-b & \cdots & a_n \\ \vdots & \vdots & & \vdots \\ a_1 & a_2 & \cdots & a_n-b \end{vmatrix} = \underline{\hspace{2cm}}.$$

6. 行列式 
$$\begin{vmatrix} x+1 & x & x & \cdots & x \\ x & x+\frac{1}{2} & x & \cdots & x \\ x & x & x+\frac{1}{3} & \cdots & x \\ \vdots & \vdots & \vdots & & \vdots \\ x & x & x & \cdots & x+\frac{1}{n} \end{vmatrix} = \underline{\hspace{2cm}}.$$

7. 设多项式函数  $f(x) = \begin{vmatrix} x & 1 & 2 & 3 \\ 2 & x+1 & -1 & 4 \\ 0 & 2 & x & 4 \\ 5 & 1 & 0 & x-1 \end{vmatrix}$ , 则  $f(x)$  的四阶导数  $f^{(4)}(x) = \underline{\hspace{2cm}}.$

8. 设  $D_n = \begin{vmatrix} a+2 & 2a & 0 & \cdots & 0 & 0 \\ 1 & a+2 & 2a & \cdots & 0 & 0 \\ 0 & 1 & a+2 & \cdots & 0 & 0 \\ \vdots & \vdots & \vdots & & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & a+2 & 2a \\ 0 & 0 & 0 & \cdots & 1 & a+2 \end{vmatrix}$ , 则  $n \geq 3$  时,  $\frac{D_n - aD_{n-1}}{D_{n-1} - aD_{n-2}} = \underline{\hspace{2cm}}.$

9. 设  $n$  阶行列式

$$D_n = \begin{vmatrix} 2 & 1 & 0 & \cdots & 0 & 0 \\ 1 & 2 & 1 & \cdots & 0 & 0 \\ 0 & 1 & 2 & \cdots & 0 & 0 \\ \vdots & \vdots & \vdots & & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & 2 & 1 \\ 0 & 0 & 0 & \cdots & 1 & 2 \end{vmatrix},$$

则  $\sum_{i=1}^n D_i = \underline{\hspace{2cm}}.$



10. 计算  $|A_n| = \begin{vmatrix} 6 & 5 & 0 & \cdots & 0 & 0 \\ 1 & 6 & 5 & \cdots & 0 & 0 \\ 0 & 1 & 6 & \cdots & 0 & 0 \\ \vdots & \vdots & \vdots & & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & 6 & 5 \\ 0 & 0 & 0 & \cdots & 1 & 6 \end{vmatrix} = \underline{\hspace{2cm}}.$

11.  $D_{n+1} = \begin{vmatrix} a & -1 & 0 & \cdots & 0 \\ ax & a & -1 & \cdots & 0 \\ ax^2 & ax & a & \cdots & 0 \\ \vdots & \vdots & \vdots & & \vdots \\ ax^n & ax^{n-1} & ax^{n-2} & \cdots & a \end{vmatrix} = \underline{\hspace{2cm}}.$

12. 设  $A, B$  是 3 阶矩阵, 满足  $AB = A - B$ , 其中  $B = \begin{bmatrix} -2 & 1 & 1 \\ 1 & -2 & 1 \\ 1 & 1 & -2 \end{bmatrix}$ , 则  $|A + E| = \underline{\hspace{2cm}}.$

13. 设  $A = \begin{bmatrix} 1 & 1 & -1 \\ -1 & 1 & 1 \\ 1 & -1 & 1 \end{bmatrix}$ , 3 阶方阵  $X$  满足关系式  $2XA^* = 4A^*XA^{-1} - (A^*)^2$ , 则  $|X| = \underline{\hspace{2cm}}.$

14. 设矩阵  $A = \begin{bmatrix} 1 & 2 & 4 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 0 & 0 \\ 3 & 1 & 0 \\ 4 & 5 & 1 \end{bmatrix}$ , 则  $|A^{-1}B^* - A^*B^{-1}| = \underline{\hspace{2cm}}.$

15. 设  $A$  为奇数阶矩阵, 且  $AA^T = A^TA = E$ ,  $|A| > 0$ , 则  $|A - E| = \underline{\hspace{2cm}}.$

16. 设  $A$  是 3 阶方阵,  $\alpha_1, \alpha_2, \alpha_3$  是线性无关的 3 维列向量组, 且  $A\alpha_1 = \alpha_1 - 2\alpha_2$ ,  $A\alpha_2 = \alpha_2 - 2\alpha_3$ ,  $A\alpha_3 = \alpha_3 - 2\alpha_1$ , 则  $|A| = \underline{\hspace{2cm}}.$

### C 组



1. 设  $A$  是  $n$  阶矩阵,  $\alpha, \beta$  是  $n$  维列向量,  $a, b, c$  是实数, 已知  $|A| = a$ ,  $\begin{vmatrix} A & \alpha \\ \beta^T & b \end{vmatrix} = 0$ , 则  $\begin{vmatrix} A & \alpha \\ \beta^T & c \end{vmatrix} = \underline{\hspace{2cm}}.$

2. 计算行列式  $\begin{vmatrix} a & b & c & d \\ -b & a & -d & c \\ -c & d & a & -b \\ -d & -c & b & a \end{vmatrix}.$

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