

Trabalho Matemática

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curso: Ciencia de dados

1) Deduza A o determinante 4x4 usando a formula

$$F(A) = \sum_{\sigma \in S_n} \text{sgn}(\sigma) \left(\prod_{i=1}^n a_{\sigma(i)}^i \right) F(I)$$

$$= \sum_{\sigma \in S_n} \text{sgn}(\sigma) \prod_{i=1}^n a_{\sigma(i)}^i$$

Figure 1: Formula de Leibniz

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix}$$

$$\det(A) =$$

$$\begin{aligned} & a_{11} \cdot a_{22} \cdot a_{33} \cdot a_{44} + a_{11} \cdot a_{23} \cdot a_{34} \cdot a_{42} + a_{11} \cdot a_{24} \cdot a_{32} \cdot a_{43} \\ & + a_{12} \cdot a_{21} \cdot a_{34} \cdot a_{43} + a_{12} \cdot a_{23} \cdot a_{31} \cdot a_{44} + a_{12} \cdot a_{24} \cdot a_{33} \cdot a_{41} \\ & + a_{13} \cdot a_{21} \cdot a_{32} \cdot a_{44} + a_{13} \cdot a_{22} \cdot a_{34} \cdot a_{41} + a_{13} \cdot a_{24} \cdot a_{31} \cdot a_{42} \\ & + a_{14} \cdot a_{21} \cdot a_{33} \cdot a_{42} + a_{14} \cdot a_{22} \cdot a_{31} \cdot a_{43} + a_{14} \cdot a_{23} \cdot a_{32} \cdot a_{41} \\ & - a_{11} \cdot a_{22} \cdot a_{34} \cdot a_{43} - a_{11} \cdot a_{23} \cdot a_{32} \cdot a_{44} - a_{11} \cdot a_{24} \cdot a_{33} \cdot a_{42} \\ & - a_{12} \cdot a_{21} \cdot a_{33} \cdot a_{44} - a_{12} \cdot a_{23} \cdot a_{34} \cdot a_{41} - a_{12} \cdot a_{24} \cdot a_{31} \cdot a_{43} \\ & - a_{13} \cdot a_{21} \cdot a_{34} \cdot a_{42} - a_{13} \cdot a_{22} \cdot a_{31} \cdot a_{44} - a_{13} \cdot a_{24} \cdot a_{32} \cdot a_{41} \\ & - a_{14} \cdot a_{21} \cdot a_{32} \cdot a_{43} - a_{14} \cdot a_{22} \cdot a_{33} \cdot a_{41} - a_{14} \cdot a_{23} \cdot a_{31} \cdot a_{42} \end{aligned}$$

2) $\det(a) \neq 0$ e $\det(a) = 0$

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

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

$$\det(a) = -48$$

$$a = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 0 & 8 \\ -1 & -2 & -3 & -4 \\ 2 & 5 & 8 & 11 \end{bmatrix}$$

$$\det(a) = 0$$

3) O código que replica a formula de Leibinz em python:

```
matriz = [[4, 0, 0, 0],
          [1, 0, 1, 1],
          [-6, 6, 1, 3],
          [2, 0, -1, 1]]

def leibniz(matriz) :
    n = len(matriz)
    if n == 1:
        return matriz[0][0]
    else:
        soma = 0
        for j in range(n):
            nova_matriz = []
            for i in range(1, n):
                linha = []
                for k in range(n):
                    if k != j:
                        linha.append(matriz[i][k])
                nova_matriz.append(linha)
            sinal = (-1) ** j
            soma += matriz[0][j] * sinal * leibniz(
                nova_matriz)
        return soma

determinante = leibniz(matriz)

print("O determinante da matriz :", determinante)

Comprovando no console as duas matrizes do 2)
```

```
C exercicios_funcoes_Felipe-Zanon_Joao-Batista.c  matriz = [[4, 0, 0, 0]],py X

C: > Users > lab55 >  matriz = [[4, 0, 0, 0]],py > ...

1  matriz = [[4, 0, 0, 0],
2          [1, 0, 1, 1],
3          [-6, 6, 1, 3],
4          [2, 0, -1, 1]]
5
6  def leibniz(matriz) :
7      n = len(matriz)
8      if n == 1:
9          return matriz[0][0]
10     else:
11         soma = 0
12         for j in range(n):
13             nova_matriz = []
14             for i in range(1, n):
15                 linha = []
16                 for k in range(n):
17                     if k != j:
18                         linha.append(matriz[i][k])
19                 nova_matriz.append(linha)
20             sinal = (-1) ** j
21             soma += matriz[0][j] * sinal * leibniz(nova_matriz)
22         return soma
23
24  determinante = leibniz(matriz)
25
26  print("O determinante da matriz :", determinante)

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

PS C:\Users\lab55> & C:/Python311/python.exe "c:/Users/lab55/matriz.py"
O determinante da matriz : -48
```

Figure 2:³ Caption