미분적분학 II(국방정보공학과)

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Quiz I

성명(학번) _____ 송민경 (2020032306) _____

1. 다음의 순열

$\alpha = \begin{pmatrix} 12345 \\ 43512 \end{pmatrix}$, $\beta = \begin{pmatrix} 12345 \\ 31425 \end{pmatrix}$ 에 대하여, $(\alpha\beta)^{-1}$을 구하여라. (4점)

$$\alpha\beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 5 & 4 & 1 & 3 & 2 \end{pmatrix}$$

$$\therefore (\alpha\beta)^{-1} = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 5 & 4 & 2 & 1 \end{pmatrix}$$

2. 다음 행렬의 행렬식을 계산하여 t의 함수로 표현한 후, $t = -3$일 때의 값을 구하시오. (5점)

$$\begin{bmatrix} t+3 & -1 & 1 \\ 7 & t-5 & 1 \\ 6 & -6 & t+2 \end{bmatrix}$$

$$= \begin{vmatrix} t+3 & -1 & 1 \\ 7 & t-5 & 1 \\ 6 & -6 & t+2 \end{vmatrix} = (t+3)\begin{vmatrix} t-5 & 1 \\ -6 & t+2 \end{vmatrix} + 1\begin{vmatrix} 7 & 1 \\ 6 & t+2 \end{vmatrix} + 1\begin{vmatrix} 7 & t-5 \\ 6 & -6 \end{vmatrix}$$

$$= (t+3)((t-5)(t+2)+6) + (7t+14-6) + (-42-6t+30)$$

$$= (t+3)(t^2-3t-4) + (t-4)$$

$$= (t+3)(t+1)(t-4) + (t-4)$$

$$= (t-4)((t+3)(t+1)+1)$$

$$= (t-4)(t+2)^2 \qquad t=-3일 때, \quad -7$$

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3. 아래 행렬식을 인수분해 하시오. (6점)

$$\begin{vmatrix} a & b & c & d \\ b & a & d & c \\ c & d & a & b \\ d & c & b & a \end{vmatrix}$$

$$= a\begin{vmatrix} a & d & c \\ d & a & b \\ c & b & a \end{vmatrix} - b\begin{vmatrix} b & d & c \\ c & a & b \\ d & b & a \end{vmatrix} + c\begin{vmatrix} b & a & c \\ c & d & b \\ d & c & a \end{vmatrix} - d\begin{vmatrix} b & a & d \\ c & d & a \\ d & c & b \end{vmatrix}$$

$$= a(a^3 + bcd + bcd - ac^2 - ab^2 - ad^2) - b(a^2b + bd^2 + bc^2 - acd - b^3 - acd)$$

$$+ c(abd + abd + c^3 - cd^2 - b^2c - a^2c) - d(b^2d + a^2d + c^2d - d^3 - abc - abc)$$

$$= a^2(a^2 - b^2 - c^2 - d^2) - b^2(a^2 + d^2 + c^2 - b^2) + c^2(c^2 - d^2 - b^2 - a^2) - d^2(b^2 + a^2 + c^2 - d^2) + 8abcd$$

$$= a^4 + b^4 - 2a^2b^2 + c^4 - 2a^2c^2 - 2b^2c^2 + d^4 - 2a^2d^2 - 2b^2d^2 - 2c^2d^2 + 8abcd$$

$$= (a^2 - b^2)^2 + (c^2 - d^2)^2 - (c-d)^2(a+b)^2 - (c+d)^2(a-b)^2$$

$$= \{(a+b)^2 - (c+d)^2\}\{(a-b)^2 - (c-d)^2\}$$

$$= (a+b+c+d)(a+d-b-c)(a+c-b-d)(a+b-c-d)$$