линейных пр-ов над $\mathbb{R}$
(обозн. $W(\mathbb{R})$)

Д/З #2. а)

$$\begin{pmatrix} 0 & 18 & 15 & 11 & 11 \\ 0 & 0 & 10 & 15 & 13 \\ 0 & 0 & 0 & 17 & 12 \\ 0 & 0 & 0 & 0 & 14 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 18 & 15 & 11 & 11 \\ 0 & 0 & 10 & 15 & 13 \\ 0 & 0 & 0 & 17 & 12 \\ 0 & 0 & 0 & 0 & 14 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 180 & 15\cdot 15+5\cdot 14 & 18\cdot 13+15\cdot 12+11\cdot 14 \\ 0 & 0 & 0 & 170 & 130+18\cdot 14 \\ 0 & 0 & 0 & 0 & 17\cdot 14 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 180 & 579 & 568 \\ 0 & 0 & 170 & 372 & \\ 0 & 0 & 0 & 238 & \\ 0 & 0 & 0 & 0 & \\ 0 & 0 & 0 & 0 & \end{pmatrix}^2 = \begin{pmatrix} 0 & 0 & 0 & 0 & 42840 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 42840 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \cdot \begin{pmatrix} 0 & 0 & 180 & 534 & 568 \\ 0 & 0 & 0 & 170 & 372 \\ 0 & 0 & 0 & 0 & 238 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} =$$

$$= \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

②
$$\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$$

$$\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = \begin{vmatrix} 1 & a & a^2+bc \\ 1 & b & a(b+c) \\ 1 & c & a(b+c) \end{vmatrix} =$$

$$= \begin{vmatrix} 1 & a & a^2+bc+ab+ac \\ 1 & b & b^2+ab+ac+bc \\ 1 & c & c^2+ab+ac+bc \end{vmatrix} =$$

$$= \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} + \begin{vmatrix} 1 & a & bc+ab+ac \\ 1 & b & bc+ab+ac \\ 1 & c & bc+ab+ac \end{vmatrix} =$$

$$= \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} + ab+bc+ac \begin{vmatrix} 1 & a & 1 \\ 1 & b & 1 \\ 1 & c & 1 \end{vmatrix} =$$

$$= \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} + 0 \cdot \Gamma \cdot \gamma.$$

(3) $\begin{vmatrix} 2 & -4 & 1 & 2 \\ -4 & 0 & 3 & 2 \\ 0 & -3 & 0 & -2 \\ 0 & -2 & 0 & 0 \end{vmatrix} = (-1)^6 \cdot (-2) \cdot \begin{vmatrix} 2 & 1 & 2 \\ -4 & 3 & 2 \\ 0 & 0 & -2 \end{vmatrix} \rightarrow$

$= (-2) \cdot (-2) \cdot (6 + 4) = 40$

(4) $\begin{vmatrix} 4 & 0 & 1 & -5 \\ 0 & -2 & 1 & -3 \\ -2 & -3 & -4 & 2 \\ 1 & 0 & -4 & 4 \end{vmatrix} = (-2) \cdot \begin{vmatrix} 4 & 1 & -5 \\ -2 & -4 & 2 \\ 1 & -4 & 4 \end{vmatrix} -$

$-(-2) \begin{vmatrix} 4 & 1 & -5 \\ 0 & 1 & -3 \\ 1 & -4 & 4 \end{vmatrix} = (-2) \left(4 \overset{-32}{(-16+8)} + \right.$

$+ 2 \overset{-32}{(4 - 20)} + \overset{-16}{(2 - 20)} + \overset{-18}{}$

$\left. + 3 (16 + 5 + 3 \overset{-51}{(-16 - 1)}) \right) =$

$= 36 - 90 = -54$ 74

(5) $\begin{vmatrix} -20 & x & -2 \\ 4 & -6 & 4 \\ -8 & 2 & x \end{vmatrix} =$

$= \begin{vmatrix} -20 & x & -2 \\ 4 & -6 & 4 \\ 0 & -20 & 8+x \end{vmatrix} =$

$\rightarrow$

$= 20(-40+4) + (8+x)(60-4x)$

$= -360 + (480 + 60x - 32x - 4x^2)$

$= -4x^2 + 28x + 120 = 0$

$x^2 - 7x - 30 = 0$

$D = 49 + 120 = 169$

$x = \frac{7 \pm 13}{2} = 10, -3$

(6) $2 \cdot 2 \cdot (-3) \cdot (-3) \cdot (-2) = -18$

(7)

$$\begin{vmatrix} 2 & 2 & 1 & -2 & 2 & 1 \\ -6 & -9 & -5 & 4 & -7 & -4 \\ 0 & 3 & 4 & 4 & -2 & 3 \\ 0 & 3 & 2 & 2 & 3 & 2 \\ 0 & 3 & 2 & 2 & 0 & -2 \\ 0 & 6 & 4 & 4 & 1 & 1 \end{vmatrix} \cdot 3 =$$

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

$$= 2 \cdot (-3) \cdot 2 \cdot (-1) \cdot 2 = 24$$