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Homework Assignment 11

Алгебра и геометрия, 1 семестр

2023.12.25

Задача 1032(j).

Найти собственные значения и собственные векторы матрицы $\begin{pmatrix} 2 & 5 & -6 \\ 4 & 6 & -9 \\ 3 & 6 & -8 \end{pmatrix}$

Решение:

$det(A - \lambda E) = \begin{vmatrix} 2-\lambda & 5 & -6 \\ 4 & 6-\lambda & -9 \\ 3 & 6 & -8-\lambda \end{vmatrix} = \begin{vmatrix} 2-\lambda & 5 & -6 \\ 1 & -\lambda & \lambda-1 \\ 3 & 6 & -8-\lambda \end{vmatrix} = \begin{vmatrix} 2-\lambda & 5 & -1 \\ 1 & -\lambda & -1 \\ 3 & 6 & -2-\lambda \end{vmatrix} =$
$\begin{vmatrix} 1-\lambda & 5+\lambda & 0 \\ 1 & -\lambda & -1 \\ 3 & 6 & -2-\lambda \end{vmatrix} = (1-\lambda)\begin{vmatrix} -\lambda & -1 \\ 6 & -2-\lambda \end{vmatrix} - (5+\lambda)\begin{vmatrix} 1 & -1 \\ 3 & -2-\lambda \end{vmatrix} = (1-\lambda)(\lambda^2 + 2\lambda +$
$6) - (5+\lambda)(-2-\lambda+3) = 1 - \lambda^3$

$f(\lambda) = 0 \Rightarrow \lambda = 1$

$\lambda = 1 : \begin{pmatrix} 1 & 5 & -6 \\ 4 & 5 & -9 \\ 3 & 6 & -9 \end{pmatrix} X = 0$

$\left(\begin{array}{ccc|c} 1 & 5 & -6 & 0 \\ 4 & 5 & -9 & 0 \\ 3 & 6 & -9 & 0 \end{array}\right)_{S_2-4S_1; S_3-3S_1} \Rightarrow \left(\begin{array}{ccc|c} 1 & 5 & -6 & 0 \\ 0 & -15 & 15 & 0 \\ 0 & -9 & 9 & 0 \end{array}\right)_{5S_3-3S_2} \Rightarrow \left(\begin{array}{ccc|c} 1 & 5 & -6 & 0 \\ 0 & -15 & 15 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right)$

$\begin{cases} x_1 + 5x_2 - 6x_3 = 0 \\ -15x_2 + 15x_3 = 0 \end{cases} \Rightarrow \begin{cases} x_1 = x_3 \\ x_2 = x_3 \end{cases} \Rightarrow$

$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} x_3 \Rightarrow \vartheta = \begin{pmatrix} 1 & 1 & 1 \end{pmatrix}^T$

Ответ: $\lambda = 1; \vartheta = \begin{pmatrix} 1 & 1 & 1 \end{pmatrix}^T$

Задача 1032(h).

Найти собственные значения и собственные векторы матрицы $\begin{pmatrix} 0 & 2 & 1 \\ -2 & 0 & 3 \\ -1 & -3 & 0 \end{pmatrix}$

Решение:

$\begin{vmatrix} -\lambda & 2 & 1 \\ -2 & -\lambda & 3 \\ -1 & -3 & -\lambda \end{vmatrix} = (-\lambda^3 - 6 + 6) - (\lambda + 4\lambda + 9\lambda) = -\lambda^3 - 15\lambda = 0$

$-\lambda(\lambda^2 + 15) = 0$

$\lambda \in \{0\}$ Найдем собственный вектор:

$\begin{pmatrix} x \\ y \\ z \end{pmatrix}^T * \begin{pmatrix} 0 & 2 & 1 \\ -2 & 0 & 3 \\ -1 & -3 & 0 \end{pmatrix} = \begin{pmatrix} -2y - z \\ 2x - 3z \\ x + 3y \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$ Решим систему

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

Итого:
$\lambda = 0$
$v = \begin{pmatrix} \frac{3}{2} \\ -\frac{1}{2} \\ 1 \end{pmatrix}$

Задача .

Найти собственные значения и собственные векторы матрицы $\begin{pmatrix} 0 & 1 & 1 & -1 \\ 1 & 0 & -1 & 1 \\ 1 & -1 & 0 & 1 \\ -1 & 1 & 1 & 0 \end{pmatrix}$

Решение:

$$det(A-\lambda E) = \left| \begin{array}{cccc} -\lambda & 1 & 1 & -1 \\ 1 & -\lambda & -1 & 1 \\ 1 & -1 & -\lambda & 1 \\ -1 & 1 & 1 & -\lambda \end{array} \right|_{S_4+S_3} = \left| \begin{array}{cccc} -\lambda & 1 & 1 & -1 \\ 1 & -\lambda & -1 & 1 \\ 1 & -1 & -\lambda & 1 \\ 0 & 0 & 1-\lambda & 1-\lambda \end{array} \right| =$$

$$(1-\lambda)(-1)^{4+3} \left| \begin{array}{ccc} -\lambda & 1 & -1 \\ 1 & -\lambda & 1 \\ 1 & -1 & 1 \end{array} \right| + (1-\lambda)(-1)^{4+4} \left| \begin{array}{ccc} -\lambda & 1 & 1 \\ 1 & -\lambda & -1 \\ 1 & -1 & -\lambda \end{array} \right| =$$

$$(\lambda-1)(\lambda^2-2\lambda+1)+(1-\lambda)(-\lambda^3+3\lambda-2) = \lambda^4-6\lambda^2+8\lambda-3 = (\lambda-1)^3(\lambda+3)$$

$$f(\lambda) = 0 \Rightarrow \left[\begin{array}{l} \lambda = 1, \\ \lambda = -3 \end{array} \right.$$

$$\lambda = 1: \begin{pmatrix} -1 & 1 & 1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & -1 & 1 \\ -1 & 1 & 1 & -1 \end{pmatrix} X = 0$$

$$\left(\begin{array}{cccc|c} -1 & 1 & 1 & -1 & 0 \\ 1 & -1 & -1 & 1 & 0 \\ 1 & -1 & -1 & 1 & 0 \\ -1 & 1 & 1 & -1 & 0 \end{array} \right) \Rightarrow \left(\begin{array}{cccc|c} -1 & 1 & 1 & -1 & 0 \\ 1 & -1 & -1 & 1 & 0 \\ 1 & -1 & -1 & 1 & 0 \\ -1 & 1 & 1 & -1 & 0 \end{array} \right)_{S_2+S_1;S_3+S_1;S_4-S_1} \Rightarrow \left(\begin{array}{cccc|c} -1 & 1 & 1 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array} \right)$$

$$-x_1+x_2+x_3-x_4 = 0 \Rightarrow x_1 = -x_2-x_3+x_4$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} -1 \\ 1 \\ 0 \\ 0 \end{pmatrix} x_2 + \begin{pmatrix} -1 \\ 0 \\ 1 \\ 0 \end{pmatrix} x_3 + \begin{pmatrix} 1 \\ 0 \\ 0 \\ 1 \end{pmatrix} x_4$$

$$\vartheta_1 = \begin{pmatrix} -1 \\ 1 \\ 0 \\ 0 \end{pmatrix}; \vartheta_2 = \begin{pmatrix} -1 \\ 0 \\ 1 \\ 0 \end{pmatrix}; \vartheta_3 = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 1 \end{pmatrix}$$

$$\lambda = -3: \begin{pmatrix} 3 & 1 & 1 & -1 \\ 1 & 3 & -1 & 1 \\ 1 & -1 & 3 & 1 \\ -1 & 1 & 1 & 3 \end{pmatrix} X = 0$$

$$\left(\begin{array}{cccc|c} 3 & 1 & 1 & -1 & 0 \\ 1 & 3 & -1 & 1 & 0 \\ 1 & -1 & 3 & 1 & 0 \\ -1 & 1 & 1 & 3 & 0 \end{array} \right)_{3S_2-S_1;3S_3-S_1;3S_4+S_1} \Rightarrow \left(\begin{array}{cccc|c} 3 & 1 & 1 & -1 & 0 \\ 0 & 8 & -6 & 6 & 0 \\ 0 & -6 & 8 & 6 & 0 \\ 0 & 4 & 4 & 8 & 0 \end{array} \right) \Rightarrow$$

$$\left(\begin{array}{rrrr|r} 3 & 1 & 1 & -1 & 0 \\ 0 & 8 & -6 & 6 & 0 \\ 0 & -6 & 8 & 6 & 0 \\ 0 & 4 & 4 & 8 & 0 \end{array}\right)_{4S_3+3S_2;2S_4-S_2} \Rightarrow \left(\begin{array}{rrrr|r} 3 & 1 & 1 & -1 & 0 \\ 0 & 8 & -6 & 6 & 0 \\ 0 & 0 & 14 & 42 & 0 \\ 0 & 0 & 14 & 10 & 0 \end{array}\right)_{S_4-S_3} \Rightarrow \left(\begin{array}{rrrr|r} 3 & 1 & 1 & -1 & 0 \\ 0 & 8 & -6 & 6 & 0 \\ 0 & 0 & 14 & 42 & 0 \\ 0 & 0 & 0 & -32 & 0 \end{array}\right)$$

$$\begin{cases} 3x_1 + x_2 + x_3 - x_4 = 0 \\ 8x_2 - 6x_3 + 6x_4 = 0 \\ 14x_3 + 42x_4 = 0 \\ -32x_4 = 0 \end{cases} \Rightarrow \begin{cases} x_1 = 0 \\ x_2 = 0 \\ x_3 = 0 \\ x_4 = 0 \end{cases}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$\vartheta_1 = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

Ответ: $\lambda_1 = 1; \vartheta_1 = \begin{pmatrix} -1 \\ 1 \\ 0 \\ 0 \end{pmatrix}; \vartheta_2 = \begin{pmatrix} -1 \\ 0 \\ 1 \\ 0 \end{pmatrix}; \vartheta_3 = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 1 \end{pmatrix}; \lambda_2 = -3; \vartheta_4 = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$

Задача 1033.b.
Найти собственные значения матрицы

$$\begin{pmatrix} 0 & 1 & 0 & \dots & 0 & 0 & 0 \\ -1 & 0 & 1 & \dots & 0 & 0 & 0 \\ 0 & -1 & 0 & \dots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & 0 & 1 & 0 \\ 0 & 0 & 0 & \dots & -1 & 0 & 1 \\ 0 & 0 & 0 & \dots & 0 & -1 & 0 \end{pmatrix}$$

Решение:

$$det(A - \lambda E) = \begin{vmatrix} -\lambda & 1 & 0 & \dots & 0 & -\lambda & 0 \\ -1 & 0 & 1 & \dots & 0 & 0 & 0 \\ 0 & -1 & -\lambda & \dots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & -\lambda & 1 & 0 \\ 0 & 0 & 0 & \dots & -1 & -\lambda & 1 \\ 0 & 0 & 0 & \dots & 0 & -1 & -\lambda \end{vmatrix} = -\lambda \begin{vmatrix} 0 & 1 & 0 & \dots & 0 & 0 & 0 \\ -1 & -\lambda & 1 & \dots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & -\lambda & 1 & 0 \\ 0 & 0 & 0 & \dots & -1 & -\lambda & 1 \\ 0 & 0 & 0 & \dots & 0 & -1 & -\lambda \end{vmatrix} +$$

$$1(-1)^{1+1} \begin{vmatrix} -1 & 1 & 0 & \dots & 0 & 0 & 0 \\ 0 & -\lambda & 1 & \dots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & -\lambda & 1 & 0 \\ 0 & 0 & 0 & \dots & -1 & -\lambda & 1 \\ 0 & 0 & 0 & \dots & 0 & -1 & -\lambda \end{vmatrix} = -\lambda \triangle_{n-1} + \triangle_{n-2}$$

Получаем рекуррентную формулу: $\triangle_n = -\lambda \triangle_{n-1} + \triangle_{n-2}$ $\triangle_2 = -\lambda \triangle_1 + \triangle_0$
$\triangle_2 = \lambda^2 + 1; \triangle_1 = -\lambda$
$\triangle_0 = 1$

$G(z) = \dfrac{c_0 + c_1 z - \alpha c_0 z}{1 - \alpha z - \beta z^2}; \alpha = -\lambda; \beta = 1$

$G(z) = \dfrac{1 - \lambda z + \lambda z}{1 + \lambda z - z^2}$

$z_{1|2} = \dfrac{-\lambda \pm \sqrt{\lambda^2 + 4}}{-2} = \dfrac{\lambda \mp \sqrt{\lambda^2 + 4}}{2}$

Пусть $z_{1|2} = \cos\theta + i\sin\theta$

$\dfrac{\lambda \mp \sqrt{\lambda^2 + 4}}{2} = \cos\theta + i\sin\theta \Rightarrow \lambda^2 + 4 = 4(\cos 2\theta + i\sin 2\theta) - 4\lambda(\cos\theta + i\sin\theta) + \lambda^2 \Rightarrow$

$1 = \cos 2\theta - \lambda\cos\theta \Rightarrow \lambda = \dfrac{\cos 2\theta - 1}{\cos\theta}$

$\dfrac{1}{1 + \lambda z - z^2} = \dfrac{A}{z_1 - z} + \dfrac{B}{z_2 - z} = \dfrac{A(z_2 - z) + B(z_1 - z)}{(z_1 - z)(z_2 - z)} \Rightarrow$

$\begin{cases} A(z_2 - z_1) = 1 \\ B(z_1 - z_2) = 1 \end{cases} \Rightarrow \begin{cases} A = \dfrac{i}{2\sin\theta} \\ B = -\dfrac{i}{2\sin\theta} \end{cases}$

$\triangle_n = \dfrac{A}{z_1^{n+1}} + \dfrac{B}{z_2^{n+1}} = \dfrac{i}{2\sin\theta}\dfrac{1}{(\cos\theta + i\sin\theta)^{n+1}} - \dfrac{i}{2\sin\theta}\dfrac{1}{(\cos\theta - i\sin\theta)^{n+1}} = \dfrac{i}{2\sin\theta}(\dfrac{1}{(\cos\theta + i\sin\theta)^{n+1}} -$
$\dfrac{1}{(\cos\theta - i\sin\theta)^{n+1}}) = \dfrac{i}{2\sin\theta}\dfrac{-2i\sin\theta(n+1)}{\cos^2\theta(n+1) + \sin^2\theta(n+1)} = \dfrac{\sin\theta(n+1)}{\sin\theta(\cos^2\theta(n+1) + \sin^2\theta)} = \dfrac{\sin\theta(n+1)}{\sin\theta} \Rightarrow$

$\triangle_n = \dfrac{\sin\theta(n+1)}{\sin\theta}$

$\triangle_n X = 0$

$fracsin(\theta)(n+1)\sin\theta = 0$

$\sin\theta(n+1) = 0$

$\theta(n+1) = \dfrac{\pi}{2} + 2\pi k, k \in Z$

$\theta = \dfrac{\pi + 4\pi k}{2(n+1)}, k \in Z$

В итоге получаем, что $\theta = \dfrac{\cos\frac{\pi + 4\pi k}{(n+1)} - 1}{\cos\frac{\pi + 4\pi k}{2(n+1)}}$

Ответ: $\theta = \dfrac{\cos\frac{\pi + 4\pi k}{(n+1)} - 1}{\cos\frac{\pi + 4\pi k}{2(n+1)}}$

Задача 1034.

Найти собственные значения матрицы

$$\begin{pmatrix} -1 & 1 & 0 & \dots & 0 & 0 \\ 1 & 0 & 1 & \dots & 0 & 0 \\ 0 & 1 & 0 & \dots & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & 0 & 1 \\ 0 & 0 & 0 & \dots & 1 & 0 \end{pmatrix}$$

Решение:

$$\begin{pmatrix} -1-\lambda & 1 & 0 & \dots & 0 & 0 \\ 1 & -\lambda & 1 & \dots & 0 & 0 \\ 0 & 1 & -\lambda & \dots & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & -\lambda & 1 \\ 0 & 0 & 0 & \dots & 1 & -\lambda \end{pmatrix} = (-1-\lambda) \begin{pmatrix} -\lambda & 1 & \dots & 0 & 0 \\ 1 & -\lambda & \dots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \dots & -\lambda & 1 \\ 0 & 0 & \dots & 1 & -\lambda \end{pmatrix} -$$

$$\begin{pmatrix} -\lambda & 1 & \dots & 0 & 0 \\ 0 & -\lambda & \dots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \dots & -\lambda & 1 \\ 0 & 0 & \dots & 1 & -\lambda \end{pmatrix} = - \begin{pmatrix} -\lambda & 1 & \dots & 0 & 0 \\ 1 & -\lambda & \dots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \dots & -\lambda & 1 \\ 0 & 0 & \dots & 1 & -\lambda \end{pmatrix} - \begin{pmatrix} -\lambda & 1 & \dots & 0 & 0 \\ 1 & -\lambda & \dots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \dots & -\lambda & 1 \\ 0 & 0 & \dots & 1 & -\lambda \end{pmatrix}$$

$$\begin{pmatrix} -\lambda & 1 & \dots & 0 & 0 \\ 1 & -\lambda & \dots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \dots & -\lambda & 1 \\ 0 & 0 & \dots & 1 & -\lambda \end{pmatrix} = \triangle_n$$

$\triangle_n = -\lambda \triangle_{n-1} - \triangle_{n-2}$

$G(z) = \dfrac{c_0 + c_1 z - \alpha c_0 z}{1 - \alpha z - \beta z^2}$

$\alpha = -\lambda; \beta = -1$

$c_0 = 1; c_1 = -\lambda; c_2 = \lambda^2 - 1$

$G(z) = \dfrac{1}{1 + \lambda z + z^2}$

$z_{1|2} = \dfrac{\lambda \pm \sqrt{\lambda^2 - 4}}{2}$

Пусть $z_{1|2} = \cos\theta \pm i \sin\theta$

$\dfrac{\lambda \pm \sqrt{\lambda^2 - 4}}{2} = \cos\theta \pm i \sin\theta$

$\lambda^2 - 4 = 4(cos2\theta + isin2\theta) + 4\lambda(cos\theta + isin\theta) + \lambda^2$

$-1 = \cos 2\theta + \lambda \cos\theta$

$\lambda = \dfrac{-1 - cos2\theta}{cos\theta}$

$\dfrac{1}{1 + \lambda z + z^2} = \dfrac{A(z_2 - z) + B(z_1 - z)}{(z_1 - z)(z_2 - z)}$

$\begin{cases} A(z_2 - z_1) = 1 \\ B(z_1 - z_2) = 1 \end{cases}; \begin{cases} A = \dfrac{i}{2sin\theta} \\ B = -\dfrac{i}{2sin\theta} \end{cases}$

$\triangle_{n-1} = \dfrac{A}{z_1^n} + \dfrac{B}{z_2^n} = \dfrac{i}{2\sin\theta}\left(\dfrac{1}{(\cos\theta + i\sin\theta)^n} - \dfrac{1}{(\cos\theta - i\sin\theta)^n}\right) = \dfrac{\sin\theta n}{\sin\theta(\cos^2\theta n + \sin^2\theta n)} = \dfrac{\sin\theta n}{\sin\theta}$

$\triangle_{n-2} = \dfrac{sin\theta(n-1)}{sin\theta}$

$-\dfrac{sin\theta n}{sin\theta} - \dfrac{sin\theta(n-1)}{sin\theta} = 0 \Rightarrow -\sin\theta n = \sin(\theta n - \theta) \Rightarrow \theta = -\pi$

$\lambda = \dfrac{-1 - cos2\theta}{cos\theta} = 2$

Ответ: 2

Задача 1035.
Найти собственные значения матрицы
$$\begin{pmatrix} 0 & x & x & \dots & x \\ y & 0 & x & \dots & x \\ y & y & 0 & \dots & x \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ y & y & y & \dots & 0 \end{pmatrix}$$

Решение:
$$\begin{pmatrix} -\lambda & x & x & \dots & x \\ y & -\lambda & x & \dots & x \\ y & y & -\lambda & \dots & x \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ y & y & y & \dots & -\lambda \end{pmatrix}_{S_{i+1}-S_i, i=\overline{1,n}} \to \begin{pmatrix} -\lambda & x & x & \dots & x \\ y+\lambda & -\lambda-x & 0 & \dots & 0 \\ 0 & y+\lambda & -\lambda-x & \dots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & -\lambda-x \end{pmatrix}$$
$$-\lambda \begin{pmatrix} -\lambda-x & 0 & \dots & 0 \\ y+\lambda & -\lambda-x & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & -\lambda-x \end{pmatrix} - x \begin{pmatrix} -\lambda-x & 0 & \dots & 0 \\ 0 & -\lambda-x & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & -\lambda-x \end{pmatrix} \dots$$
$-\lambda(-\lambda-x)^{n-1} - x(y+\lambda)(-\lambda-x)^{n-2} + \dots$
При четном n
$det(A-\lambda E) = -\lambda(-\lambda-x)^{n-1} - x(y+\lambda)(\lambda-x)^{n-2}$
$-\lambda(-\lambda-x)^{n-1} - x(y+\lambda)(-\lambda-x)^{n-2} = 0$
$\lambda_1 = \sqrt{xy}$
$\lambda_2 = -\sqrt{xy}$
При нечетном n
$det(A-\lambda E) = -\lambda(-\lambda-x)^{n-1}$
$-\lambda(-\lambda-x)^{n-1} = 0$
$\lambda_1 = 0$
$\lambda_2 = -x$
Ответ:
1)$\lambda_1 = \sqrt{xy}; \lambda_2 = -\sqrt{xy}$
2)$\lambda_1 = 0; \lambda_2 = -x$
