

# Planar Groups

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## 1 Planar Groups

### 1.1 Group 2

Generators of group:

$$\left[ \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

matrix det eigenvalue != 1 eigenvalue != -1

matrix det except

matrix conds

## 1.2 Group 3

Generators of group:

$$\left[ \begin{pmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

SNoT

$$\left[ \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

matrix det eigenvalue != 1 eigenvalue != -1

$\begin{pmatrix} x_0 & 0 \\ 0 & x_1 \end{pmatrix}$   $x_0x_1$   $(x_0 + 1)x_1 + x_0 + 1$   $(x_0 - 1)x_1 - x_0 + 1$

matrix	det	except
$\begin{pmatrix} x_0 & 0 \\ 0 & x_1 \end{pmatrix}$	$x_0x_1$	$\begin{array}{cc} -1 & -1 \\ -1 & n_1 \\ -1 & 1 \\ 1 & 1 \\ 1 & n_1 \\ 1 & -1 \\ n_1 & -1 \\ n_1 & 1 \end{array}$

matrix conds

$\begin{pmatrix} x_0 & 0 \\ 0 & x_1 \end{pmatrix}$   $\emptyset$

## 1.3 Group 4

Generators of group:

$$\left[ \begin{pmatrix} -1 & 0 & 0 \\ 0 & 1 & \frac{1}{2} \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

SNoT

$$\left[ \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 0 & 0 \\ 0 & 1 & -\frac{1}{2} \\ 0 & 0 & 1 \end{pmatrix} \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_1 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0 x_1$	$(x_0 + 1)x_1 + x_0 + 1$	$(x_0 - 1)x_1 - x_0 + 1$

matrix	det	except
$\begin{pmatrix} x_1 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0 x_1$	$\begin{array}{cc} -1 & -1 \\ -1 & n_1 \\ -1 & 1 \\ 1 & 1 \\ 1 & n_1 \\ 1 & -1 \\ n_1 & -1 \\ n_1 & 1 \end{array}$

matrix	conds
$\begin{pmatrix} x_1 & 0 \\ 0 & x_0 \end{pmatrix}$	$[-2 a_0, \frac{1}{2} x_0 - \frac{1}{2}]$

## 1.4 Group 5

Generators of group:

$$\left[ \begin{pmatrix} -1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

SNoT

$$\left[ \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 - 2x_1 & 0 \\ x_1 & x_0 \end{pmatrix}$	$(x_0 - 2x_1)x_0$	$x_0^2 - 2(x_0 + 1)x_1 + 2x_0 + 1$	$x_0^2 - 2(x_0 - 1)x_1 - 2x_0 + 1$
matrix	det	except	
$\begin{pmatrix} x_0 - 2x_1 & 0 \\ x_1 & x_0 \end{pmatrix}$	$(x_0 - 2x_1)x_0$	$2t_0 + 1 \quad t_0$ $-1 \quad -1$ $-1 \quad n_1$ $-1 \quad 0$ $1 \quad n_1$ $1 \quad 0$ $1 \quad 1$ $2t_0 - 1 \quad t_0$	
matrix	conds		
$\begin{pmatrix} x_0 - 2x_1 & 0 \\ x_1 & x_0 \end{pmatrix}$	$\emptyset$		

## 1.5 Group 6

Generators of group:

$$\left[ \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right) \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 & 0 \\ 0 & x_1 \\ 0 & x_0 \\ x_1 & 0 \end{pmatrix}$	$x_0x_1$	$(x_0 + 1)x_1 + x_0 + 1$	$(x_0 - 1)x_1 - x_0 + 1$
	$-x_0x_1$	$-x_0x_1 + 1$	$-x_0x_1 + 1$

matrix	det	except
$\begin{pmatrix} x_0 & 0 \\ 0 & x_1 \end{pmatrix}$	$x_0x_1$	$-1 -1$ $-1 n_1$ $-1 1$ $1 1$ $1 n_1$ $1 -1$ $n_1 -1$ $n_1 1$
$\begin{pmatrix} 0 & x_0 \\ x_1 & 0 \end{pmatrix}$	$-x_0x_1$	$-1 -1$ $-1 1$ $1 -1$ $1 1$

matrix	conds
$\begin{pmatrix} x_0 & 0 \\ 0 & x_1 \end{pmatrix}$	$\emptyset$
$\begin{pmatrix} 0 & x_0 \\ x_1 & 0 \end{pmatrix}$	$\emptyset$

## 1.6 Group 7

Generators of group:

$$\left[ \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & \frac{1}{2} \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & \frac{1}{2} \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & -\frac{1}{2} \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right) \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_1 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0 x_1$	$(x_0 + 1)x_1 + x_0 + 1$	$(x_0 - 1)x_1 - x_0 + 1$
matrix	det	except	
$\begin{pmatrix} x_1 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0 x_1$	-1 -1	
		-1 $n_1$	
		-1 1	
		1 1	
		1 $n_1$	
		1 -1	
		$n_1$ -1	
		$n_1$ 1	
matrix	conds		
$\begin{pmatrix} x_1 & 0 \\ 0 & x_0 \end{pmatrix}$		$[-2a_0, -2a_1, -2a_0 - \frac{1}{2}x_1 + \frac{1}{2}, \frac{1}{2}x_1 - \frac{1}{2}, -2a_1]$	

## 1.7 Group 8

Generators of group:

$$\left[ \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & \frac{1}{2} \\ 0 & 1 & \frac{1}{2} \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & \frac{1}{2} \\ 0 & 1 & -\frac{1}{2} \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & -\frac{1}{2} \\ 0 & -1 & -\frac{1}{2} \\ 0 & 0 & 1 \end{array} \right) \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 & 0 \\ 0 & x_1 \\ 0 & x_1 \\ x_0 & 0 \end{pmatrix}$	$x_0x_1$	$(x_0 + 1)x_1 + x_0 + 1$	$(x_0 - 1)x_1 - x_0 + 1$
	$-x_0x_1$	$-x_0x_1 + 1$	$-x_0x_1 + 1$

matrix	det	except
$\begin{pmatrix} x_0 & 0 \\ 0 & x_1 \end{pmatrix}$	$x_0x_1$	$-1 -1$ $-1 n_1$ $-1 1$ $1 1$ $1 n_1$ $1 -1$ $n_1 -1$ $n_1 1$
$\begin{pmatrix} 0 & x_1 \\ x_0 & 0 \end{pmatrix}$	$-x_0x_1$	$-1 -1$ $-1 1$ $1 -1$ $1 1$

matrix	conds
$\begin{pmatrix} x_0 & 0 \\ 0 & x_1 \end{pmatrix}$	$[-2a_0, -2a_1, -2a_0 - \frac{1}{2}x_0 + \frac{1}{2}, \frac{1}{2}x_1 - \frac{1}{2}, \frac{1}{2}x_0 - \frac{1}{2}, -2a_1 + \frac{1}{2}x_1 - \frac{1}{2}]$
$\begin{pmatrix} 0 & x_1 \\ x_0 & 0 \end{pmatrix}$	$[-2a_0, -2a_1, \frac{1}{2}x_1 - \frac{1}{2}, -2a_1 - \frac{1}{2}x_0 - \frac{1}{2}, -2a_0 + \frac{1}{2}x_1 + \frac{1}{2}, \frac{1}{2}x_0 - \frac{1}{2}]$

## 1.8 Group 9

Generators of group:

$$\left[ \left( \begin{array}{rrr} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} -1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \left( \begin{array}{rrr} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} -1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 1 & 0 & 0 \\ -1 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right) \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 - 2x_1 & 0 \\ x_1 & x_0 \end{pmatrix}$	$(x_0 - 2x_1)x_0$	$x_0^2 - 2(x_0 + 1)x_1 + 2x_0 + 1$	$x_0^2 - 2(x_0 - 1)x_1 - 2x_0 + 1$
$\begin{pmatrix} -x_0 & -2x_0 \\ x_1 & x_0 \end{pmatrix}$	$-x_0^2 + 2x_0x_1$	$-x_0^2 + 2x_0x_1 + 1$	$-x_0^2 + 2x_0x_1 + 1$

matrix	det	except
$\begin{pmatrix} x_0 - 2x_1 & 0 \\ x_1 & x_0 \end{pmatrix}$	$(x_0 - 2x_1)x_0$	$2t_0 + 1 \quad t_0$ $-1 \quad -1$ $-1 \quad n_1$ $-1 \quad 0$ $1 \quad n_1$ $1 \quad 0$ $1 \quad 1$ $2t_0 - 1 \quad t_0$
$\begin{pmatrix} -x_0 & -2x_0 \\ x_1 & x_0 \end{pmatrix}$	$-x_0^2 + 2x_0x_1$	$-1 \quad -1$ $-1 \quad 0$ $1 \quad 0$ $1 \quad 1$

matrix	conds
$\begin{pmatrix} x_0 - 2x_1 & 0 \\ x_1 & x_0 \end{pmatrix}$	$\emptyset$
$\begin{pmatrix} -x_0 & -2x_0 \\ x_1 & x_0 \end{pmatrix}$	$\emptyset$

## 1.9 Group 10

Generators of group:

$$\left[ \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right) \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_1 & -x_0 \\ x_0 & x_1 \\ -x_0 & x_1 \\ x_1 & x_0 \end{pmatrix}$	$x_0^2 + x_1^2$	$x_0^2 + x_1^2 + 2x_1 + 1$	$x_0^2 + x_1^2 - 2x_1 + 1$
	$-x_0^2 - x_1^2$	$-x_0^2 - x_1^2 + 1$	$-x_0^2 - x_1^2 + 1$

matrix	det	except
$\begin{pmatrix} x_1 & -x_0 \\ x_0 & x_1 \end{pmatrix}$	$x_0^2 + x_1^2$	$\begin{matrix} -1 & 0 \\ 0 & -1 \\ 0 & 1 \\ 1 & 0 \end{matrix}$
$\begin{pmatrix} -x_0 & x_1 \\ x_1 & x_0 \end{pmatrix}$	$-x_0^2 - x_1^2$	$\begin{matrix} -1 & 0 \\ 0 & -1 \\ 0 & 1 \\ 1 & 0 \end{matrix}$

matrix	conds
$\begin{pmatrix} x_1 & -x_0 \\ x_0 & x_1 \end{pmatrix}$	$\emptyset$
$\begin{pmatrix} -x_0 & x_1 \\ x_1 & x_0 \end{pmatrix}$	$\emptyset$

## 1.10 Group 11

Generators of group:

$$\left[ \left( \begin{array}{rrr} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \left( \begin{array}{rrr} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{array} \right) \right],$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	$x_0^2 + 2x_0 + 1$	$x_0^2 - 2x_0 + 1$
$\begin{pmatrix} -x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & x_0 \end{pmatrix}$	$2x_0^2$	$2x_0^2 + 2x_0 + 1$	$2x_0^2 - 2x_0 + 1$
$\begin{pmatrix} -x_0 & -x_0 \\ -x_0 & x_0 \end{pmatrix}$	$-2x_0^2$	$-2x_0^2 + 1$	$-2x_0^2 + 1$
$\begin{pmatrix} 0 & x_0 \\ -x_0 & 0 \end{pmatrix}$	$x_0^2$	$x_0^2 + 1$	$x_0^2 + 1$
$\begin{pmatrix} x_0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$2x_0^2$	$2x_0^2 + 2x_0 + 1$	$2x_0^2 - 2x_0 + 1$
$\begin{pmatrix} -x_0 & x_0 \\ x_0 & x_0 \end{pmatrix}$	$-2x_0^2$	$-2x_0^2 + 1$	$-2x_0^2 + 1$

matrix	det	except
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} -x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & x_0 \end{pmatrix}$	$2x_0^2$	[]
$\begin{pmatrix} -x_0 & -x_0 \\ -x_0 & x_0 \end{pmatrix}$	$-2x_0^2$	[]
$\begin{pmatrix} 0 & x_0 \\ -x_0 & 0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} x_0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$2x_0^2$	[]
$\begin{pmatrix} -x_0 & x_0 \\ x_0 & x_0 \end{pmatrix}$	$-2x_0^2$	[]

matrix	conds
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} -x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	[]
$\begin{pmatrix} x_0 & 0 \\ x_0 & -x_0 \end{pmatrix}$	[]
$\begin{pmatrix} x_0 & x_0 \\ -x_0 & -x_0 \end{pmatrix}$	[]
$\begin{pmatrix} -x_0 & x_0 \\ 0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} -x_0 & 0 \\ x_0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} -x_0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} x_0 & x_0 \\ x_0 & x_0 \end{pmatrix}$	[]

## 1.11 Group 12

Generators of group:

$$\left[ \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & \frac{1}{2} \\ 0 & 1 & \frac{1}{2} \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & \frac{1}{2} \\ 0 & 1 & -\frac{1}{2} \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & -\frac{1}{2} \\ 0 & -1 & -\frac{1}{2} \\ 0 & 0 & 1 \end{array} \right) \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	$x_0^2 + 2x_0 + 1$	$x_0^2 - 2x_0 + 1$
$\begin{pmatrix} -x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & x_0 \end{pmatrix}$	$2x_0^2$	$2x_0^2 + 2x_0 + 1$	$2x_0^2 - 2x_0 + 1$
$\begin{pmatrix} -x_0 & -x_0 \\ -x_0 & x_0 \end{pmatrix}$	$-2x_0^2$	$-2x_0^2 + 1$	$-2x_0^2 + 1$
$\begin{pmatrix} 0 & x_0 \\ -x_0 & 0 \end{pmatrix}$	$x_0^2$	$x_0^2 + 1$	$x_0^2 + 1$
$\begin{pmatrix} x_0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$2x_0^2$	$2x_0^2 + 2x_0 + 1$	$2x_0^2 - 2x_0 + 1$
$\begin{pmatrix} -x_0 & x_0 \\ x_0 & x_0 \end{pmatrix}$	$-2x_0^2$	$-2x_0^2 + 1$	$-2x_0^2 + 1$

matrix	det	except
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} -x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & x_0 \end{pmatrix}$	$2x_0^2$	[]
$\begin{pmatrix} -x_0 & -x_0 \\ -x_0 & x_0 \end{pmatrix}$	$-2x_0^2$	[]
$\begin{pmatrix} 0 & x_0 \\ -x_0 & 0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} x_0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$2x_0^2$	[]
$\begin{pmatrix} -x_0 & x_0 \\ x_0 & x_0 \end{pmatrix}$	$-2x_0^2$	[]

matrix	conds
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$[-2a_0, -2a_1, -a_0 - a_1, a_0 - a_1, -2a_0 - \frac{1}{2}x_0 + \frac{1}{2}, \frac{1}{2}x_0 - \frac{1}{2}, -a_0 + a_1, -a_0 - a_1, \frac{1}{2}x_0 - \frac{1}{2}]$
$\begin{pmatrix} -x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$[-2a_0, -2a_1, -a_0 + a_1, -a_0 - a_1, -2a_0 + \frac{1}{2}x_0 + \frac{1}{2}, \frac{1}{2}x_0 - \frac{1}{2}, -a_0 - a_1, a_0 - a_1, -\frac{1}{2}x_0 + \frac{1}{2}]$
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$[-2a_0, -2a_1, -a_0 + a_1, -a_0 - a_1, \frac{1}{2}x_0 - \frac{1}{2}, -2a_1 - \frac{1}{2}x_0 - \frac{1}{2}, -a_0 - a_1, a_0 - a_1, -2a_0 + \frac{1}{2}x_0 + \frac{1}{2}]$
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & x_0 \end{pmatrix}$	$[-2a_0, -2a_1, -a_0 - a_1, a_0 - a_1, -a_0 - a_1 - x_0 - \frac{1}{2}, -a_0 - a_1 + \frac{1}{2}, -a_0 + a_1, -a_0 - a_1, -2a_0 + \frac{1}{2}x_0 + \frac{1}{2}, -a_0 - a_1 + x_0 + \frac{1}{2}]$
$\begin{pmatrix} -x_0 & -x_0 \\ -x_0 & x_0 \end{pmatrix}$	$[-2a_0, -2a_1, -a_0 + a_1, -a_0 - a_1, -a_0 - a_1 - \frac{1}{2}, -a_0 - a_1 + x_0 + \frac{1}{2}, -a_0 - a_1, a_0 - a_1, -2a_0 + \frac{1}{2}x_0 + \frac{1}{2}, -a_0 - a_1 + x_0 + \frac{1}{2}]$
$\begin{pmatrix} 0 & x_0 \\ -x_0 & 0 \end{pmatrix}$	$[-2a_0, -2a_1, -a_0 - a_1, a_0 - a_1, \frac{1}{2}x_0 - \frac{1}{2}, -2a_1 + \frac{1}{2}x_0 - \frac{1}{2}, -a_0 + a_1, -a_0 - a_1, -2a_0 + \frac{1}{2}x_0 + \frac{1}{2}, -a_0 - a_1 + x_0 + \frac{1}{2}]$
$\begin{pmatrix} x_0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$[-2a_0, -2a_1, -a_0 - a_1, a_0 - a_1, -a_0 + a_1 + \frac{1}{2}, a_0 - a_1 + x_0 + \frac{1}{2}, -a_0 + a_1, -a_0 - a_1, -2a_0 + \frac{1}{2}x_0 + \frac{1}{2}, -a_0 - a_1 + x_0 + \frac{1}{2}]$
$\begin{pmatrix} -x_0 & x_0 \\ x_0 & x_0 \end{pmatrix}$	$[-2a_0, -2a_1, -a_0 + a_1, -a_0 - a_1, -a_0 + a_1 + x_0 + \frac{1}{2}, a_0 - a_1 + \frac{1}{2}, -a_0 - a_1, a_0 - a_1, -2a_0 + \frac{1}{2}x_0 + \frac{1}{2}, -a_0 - a_1 + x_0 + \frac{1}{2}]$

## 1.12 Group 13

Generators of group:

$$\left[ \begin{pmatrix} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

SNoT

$$\left[ \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 + x_1 & -x_0 \\ x_0 & x_1 \end{pmatrix}$	$x_0^2 + (x_0 + x_1)x_1$	$x_0^2 + (x_0 + 2)x_1 + x_1^2 + x_0 + 1$	$x_0^2 + (x_0 - 2)x_1 + x_1^2 - x_0 +$
$\begin{pmatrix} -x_1 & x_0 + x_1 \\ x_0 & x_1 \end{pmatrix}$	$-(x_0 + x_1)x_0 - x_1^2$	$-x_0^2 - x_0x_1 - x_1^2 + 1$	$-x_0^2 - x_0x_1 - x_1^2 + 1$

matrix	det	except
$\begin{pmatrix} x_0 + x_1 & -x_0 \\ x_0 & x_1 \end{pmatrix}$	$x_0^2 + (x_0 + x_1)x_1$	$\begin{matrix} -1 & 0 \\ -1 & 1 \\ 0 & -1 \\ 0 & 1 \\ 1 & -1 \\ 1 & 0 \end{matrix}$
$\begin{pmatrix} -x_1 & x_0 + x_1 \\ x_0 & x_1 \end{pmatrix}$	$-(x_0 + x_1)x_0 - x_1^2$	$\begin{matrix} -1 & 0 \\ -1 & 1 \\ 0 & -1 \\ 0 & 1 \\ 1 & -1 \\ 1 & 0 \end{matrix}$

matrix	conds
$\begin{pmatrix} x_0 + x_1 & -x_0 \\ x_0 & x_1 \end{pmatrix}$	$\emptyset$
$\begin{pmatrix} -x_1 & x_0 + x_1 \\ x_0 & x_1 \end{pmatrix}$	$\emptyset$

## 1.13 Group 14

Generators of group:

$$\left[ \left( \begin{array}{rrr} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \left( \begin{array}{rrr} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} -1 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} 1 & 0 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{rrr} -1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right) \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & 0 \end{pmatrix}$	$x_0^2$	$x_0^2 + x_0 + 1$	$x_0^2 - x_0 + 1$
$\begin{pmatrix} x_0 & 0 \\ x_0 & -x_0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} 0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$x_0^2$	$x_0^2 + x_0 + 1$	$x_0^2 - x_0 + 1$
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	$x_0^2 + 2x_0 + 1$	$x_0^2 - 2x_0 + 1$
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} -x_0 & x_0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$

matrix	det	except
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & 0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} x_0 & 0 \\ x_0 & -x_0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} 0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} -x_0 & x_0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	-1 1

matrix	conds
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & 0 \end{pmatrix}$	[]
$\begin{pmatrix} x_0 & 0 \\ x_0 & -x_0 \end{pmatrix}$	[]
$\begin{pmatrix} 0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	[]
$\begin{pmatrix} -x_0 & x_0 \\ 0 & x_0 \end{pmatrix}$	[]

## 1.14 Group 15

Generators of group:

$$\left[ \begin{pmatrix} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

SNoT

$$\left[ \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 0 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & -1 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & 0 \end{pmatrix}$	$x_0^2$	$x_0^2 + x_0 + 1$	$x_0^2 - x_0 + 1$
$\begin{pmatrix} x_0 & 0 \\ x_0 & -x_0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} 0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$x_0^2$	$x_0^2 + x_0 + 1$	$x_0^2 - x_0 + 1$
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	$x_0^2 + 2x_0 + 1$	$x_0^2 - 2x_0 + 1$
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} -x_0 & x_0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$

matrix	det	except
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & 0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} x_0 & 0 \\ x_0 & -x_0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} 0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} -x_0 & x_0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	-1 1

matrix	conds
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & 0 \end{pmatrix}$	[]
$\begin{pmatrix} x_0 & 0 \\ x_0 & -x_0 \end{pmatrix}$	[]
$\begin{pmatrix} 0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} 0 & x_0 \\ 0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} x_0 & 0 \\ -x_0 & x_0 \end{pmatrix}$	[]
$\begin{pmatrix} 0 & x_0 \\ 0 & x_0 \end{pmatrix}$	[]

## 1.15 Group 16

Generators of group:

$$\left[ \begin{pmatrix} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

SNoT

$$\left[ \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 0 & 1 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} x_0 + x_1 & -x_0 \\ x_0 & x_1 \end{pmatrix}$	$x_0^2 + (x_0 + x_1)x_1$	$x_0^2 + (x_0 + 2)x_1 + x_1^2 + x_0 + 1$	$x_0^2 + (x_0 - 2)x_1 + x_1^2 - x_0 +$
$\begin{pmatrix} -x_1 & x_0 + x_1 \\ x_0 & x_1 \end{pmatrix}$	$-(x_0 + x_1)x_0 - x_1^2$	$-x_0^2 - x_0x_1 - x_1^2 + 1$	$-x_0^2 - x_0x_1 - x_1^2 + 1$

matrix	det	except
$\begin{pmatrix} x_0 + x_1 & -x_0 \\ x_0 & x_1 \end{pmatrix}$	$x_0^2 + (x_0 + x_1)x_1$	$\begin{matrix} -1 & 0 \\ -1 & 1 \\ 0 & -1 \\ 0 & 1 \\ 1 & -1 \\ 1 & 0 \end{matrix}$
$\begin{pmatrix} -x_1 & x_0 + x_1 \\ x_0 & x_1 \end{pmatrix}$	$-(x_0 + x_1)x_0 - x_1^2$	$\begin{matrix} -1 & 0 \\ -1 & 1 \\ 0 & -1 \\ 0 & 1 \\ 1 & -1 \\ 1 & 0 \end{matrix}$

$$\begin{array}{c} \text{matrix} \\ \hline \left( \begin{array}{cc} x_0 + x_1 & -x_0 \\ x_0 & x_1 \\ -x_1 & x_0 + x_1 \\ x_0 & x_1 \end{array} \right) \end{array} \quad \begin{array}{c} \text{conds} \\ \hline [] \\ [] \end{array}$$

## 1.16 Group 17

Generators of group:

$$\left[ \left( \begin{array}{ccc} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array} \right) \right]$$

SNoT

$$\left[ \left( \begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & -1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} -1 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{array} \right), \left( \begin{array}{ccc} 0 & 1 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right), \right]$$

matrix	det	eigenvalue != 1	eigenvalue != -1
$\begin{pmatrix} -x_0 & 0 \\ -x_0 & x_0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & 0 \end{pmatrix}$	$x_0^2$	$x_0^2 + x_0 + 1$	$x_0^2 - x_0 + 1$
$\begin{pmatrix} 0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$x_0^2$	$x_0^2 + x_0 + 1$	$x_0^2 - x_0 + 1$
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	$x_0^2 + 2x_0 + 1$	$x_0^2 - 2x_0 + 1$
$\begin{pmatrix} -x_0 & -x_0 \\ -2x_0 & x_0 \end{pmatrix}$	$-3x_0^2$	$-3x_0^2 + 1$	$-3x_0^2 + 1$
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} \frac{1}{2}x_0 & \frac{1}{2}x_0 \\ -\frac{1}{2}x_0 & x_0 \end{pmatrix}$	$\frac{3}{4}x_0^2$	$\frac{3}{4}x_0^2 + \frac{3}{2}x_0 + 1$	$\frac{3}{4}x_0^2 - \frac{3}{2}x_0 + 1$
$\begin{pmatrix} -x_0 & x_0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	$-x_0^2 + 1$	$-x_0^2 + 1$
$\begin{pmatrix} -x_0 & \frac{1}{2}x_0 \\ -\frac{1}{2}x_0 & x_0 \end{pmatrix}$	$-\frac{3}{4}x_0^2$	$-\frac{3}{4}x_0^2 + 1$	$-\frac{3}{4}x_0^2 + 1$
$\begin{pmatrix} 2x_0 & -x_0 \\ x_0 & x_0 \end{pmatrix}$	$3x_0^2$	$3x_0^2 + 3x_0 + 1$	$3x_0^2 - 3x_0 + 1$
$\begin{pmatrix} -x_0 & 2x_0 \\ x_0 & x_0 \end{pmatrix}$	$-3x_0^2$	$-3x_0^2 + 1$	$-3x_0^2 + 1$
$\begin{pmatrix} -x_0 & 2x_0 \\ -2x_0 & x_0 \end{pmatrix}$	$3x_0^2$	$3x_0^2 + 1$	$3x_0^2 + 1$

matrix	det	except
$\begin{pmatrix} -x_0 & 0 \\ -x_0 & x_0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} x_0 & -x_0 \\ x_0 & 0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} 0 & x_0 \\ -x_0 & x_0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} x_0 & 0 \\ 0 & x_0 \end{pmatrix}$	$x_0^2$	-1 1
$\begin{pmatrix} -x_0 & -x_0 \\ -2x_0 & x_0 \end{pmatrix}$	$-3x_0^2$	[]
$\begin{pmatrix} 0 & x_0 \\ x_0 & 0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} \frac{1}{2}x_0 & \frac{1}{2}x_0 \\ -\frac{1}{2}x_0 & x_0 \end{pmatrix}$	$\frac{3}{4}x_0^2$	[]
$\begin{pmatrix} -x_0 & x_0 \\ 0 & x_0 \end{pmatrix}$	$-x_0^2$	-1 1
$\begin{pmatrix} -x_0 & \frac{1}{2}x_0 \\ -\frac{1}{2}x_0 & x_0 \end{pmatrix}$	$-\frac{3}{4}x_0^2$	[]
$\begin{pmatrix} 2x_0 & -x_0 \\ x_0 & x_0 \end{pmatrix}$	$3x_0^2$	[]
$\begin{pmatrix} -x_0 & 2x_0 \\ x_0 & x_0 \end{pmatrix}$	$-3x_0^2$	[]
$\begin{pmatrix} -x_0 & 2x_0 \\ -2x_0 & x_0 \end{pmatrix}$	$3x_0^2$	[]

matrix	conds
$\begin{pmatrix} -x_0 & 0 \\ -x_0 & x_0 \\ x_0 & -x_0 \\ x_0 & 0 \\ 0 & x_0 \\ -x_0 & x_0 \\ x_0 & 0 \\ 0 & x_0 \\ -x_0 & -x_0 \\ -2x_0 & x_0 \\ 0 & x_0 \\ x_0 & 0 \\ \frac{1}{2}x_0 & \frac{1}{2}x_0 \\ -\frac{1}{2}x_0 & x_0 \\ -x_0 & x_0 \\ 0 & x_0 \\ -x_0 & \frac{1}{2}x_0 \\ -\frac{1}{2}x_0 & x_0 \\ 2x_0 & -x_0 \\ x_0 & x_0 \\ -x_0 & 2x_0 \\ x_0 & x_0 \\ -x_0 & 2x_0 \\ -2x_0 & x_0 \end{pmatrix}$	