Игра 2 х 2

$$C = \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix} \qquad S_A^* = \begin{pmatrix} A_1 & A_2 \\ p_1^* & p_2^* \end{pmatrix} \qquad S_B^* = \begin{pmatrix} B_1 & B_2 \\ q_1^* & q_2^* \end{pmatrix}$$

$$\begin{cases} c_{11}p_1^* + c_{21}p_2^* = V \\ c_{12}p_1^* + c_{22}p_2^* = V \\ p_1^* + p_2^* = 1 \end{cases}$$

$$p_1^* = \frac{c_{22} - c_{21}}{c_{11} + c_{22} - (c_{12} + c_{21})};$$

$$p_2^* = \frac{c_{11} - c_{12}}{c_{11} + c_{22} - (c_{12} + c_{21})};$$

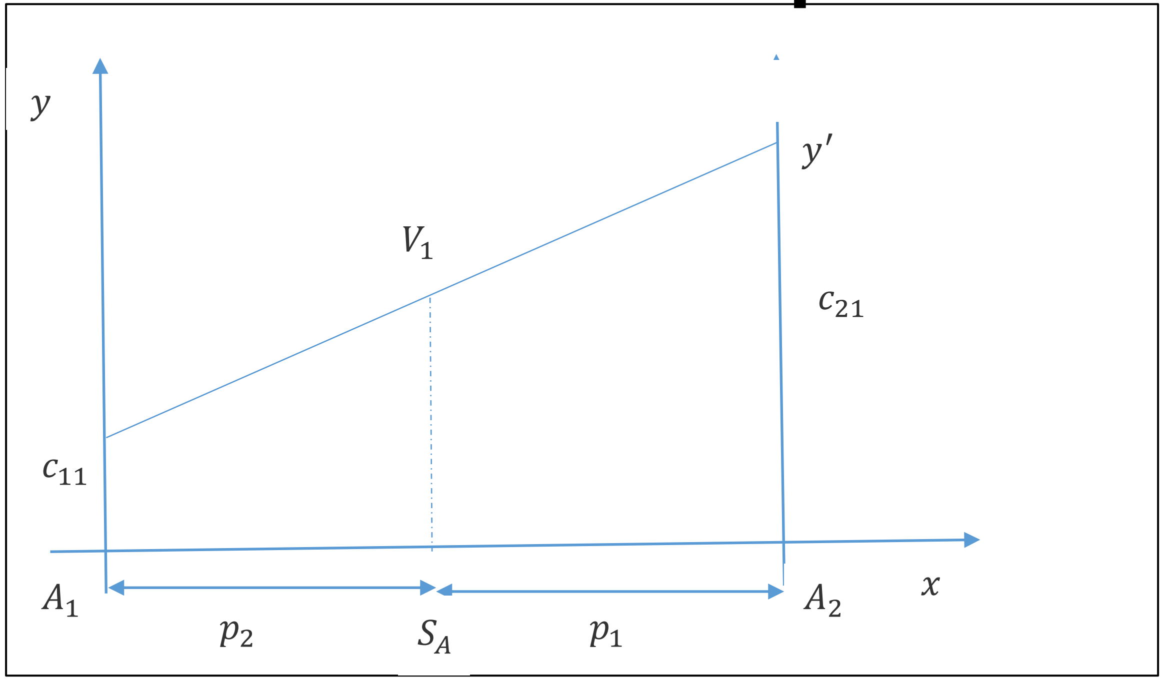
$$V = \frac{c_{22}c_{11} - c_{12}c_{21}}{c_{11} + c_{22} - (c_{12} + c_{21})}$$

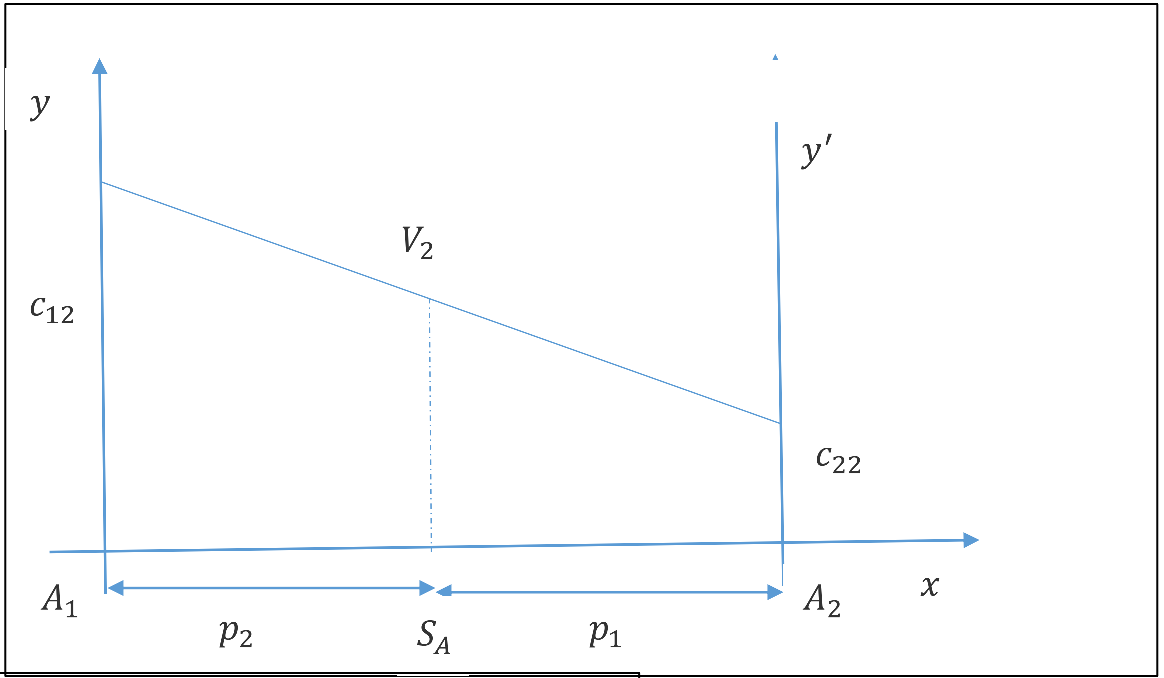
$$\begin{cases} c_{11}q_1^* + c_{12}q_2^* = V \\ c_{21}q_1^* + c_{22}q_2^* = V \\ q_1^* + q_2^* = 1 \end{cases}$$

$$q_1^* = \frac{c_{22} - c_{12}}{c_{11} + c_{22} - (c_{12} + c_{21})};$$

$$q_2^* = \frac{c_{11} - c_{21}}{c_{11} + c_{22} - (c_{12} + c_{21})};$$

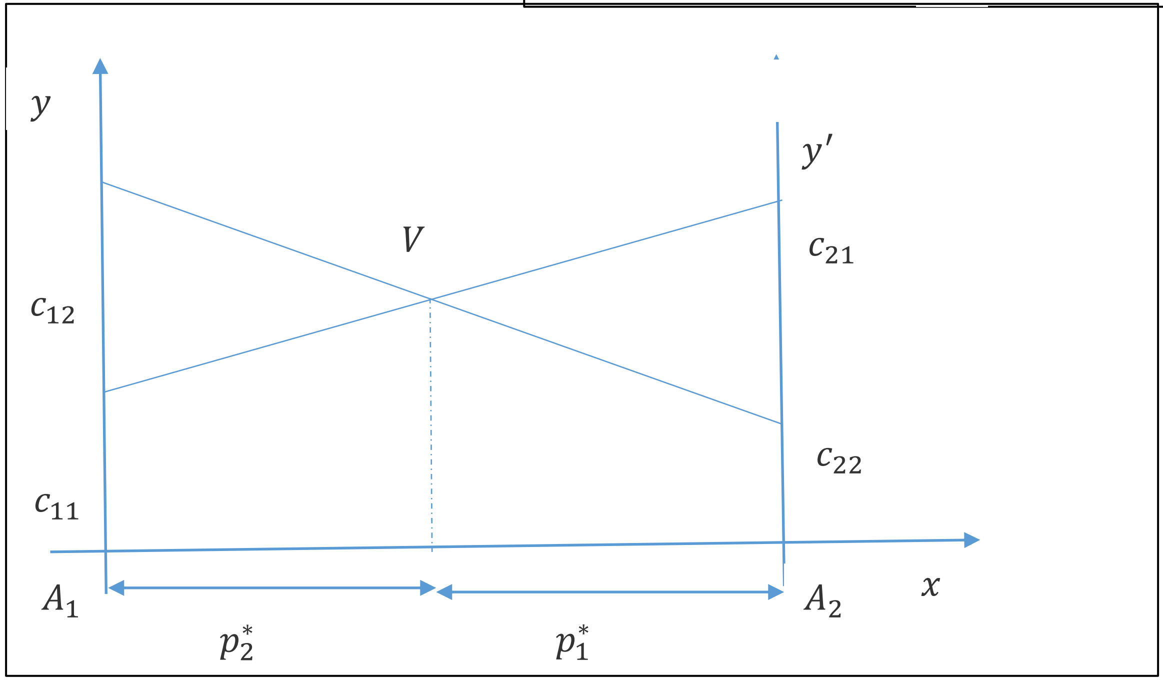
Игра 2 x 2





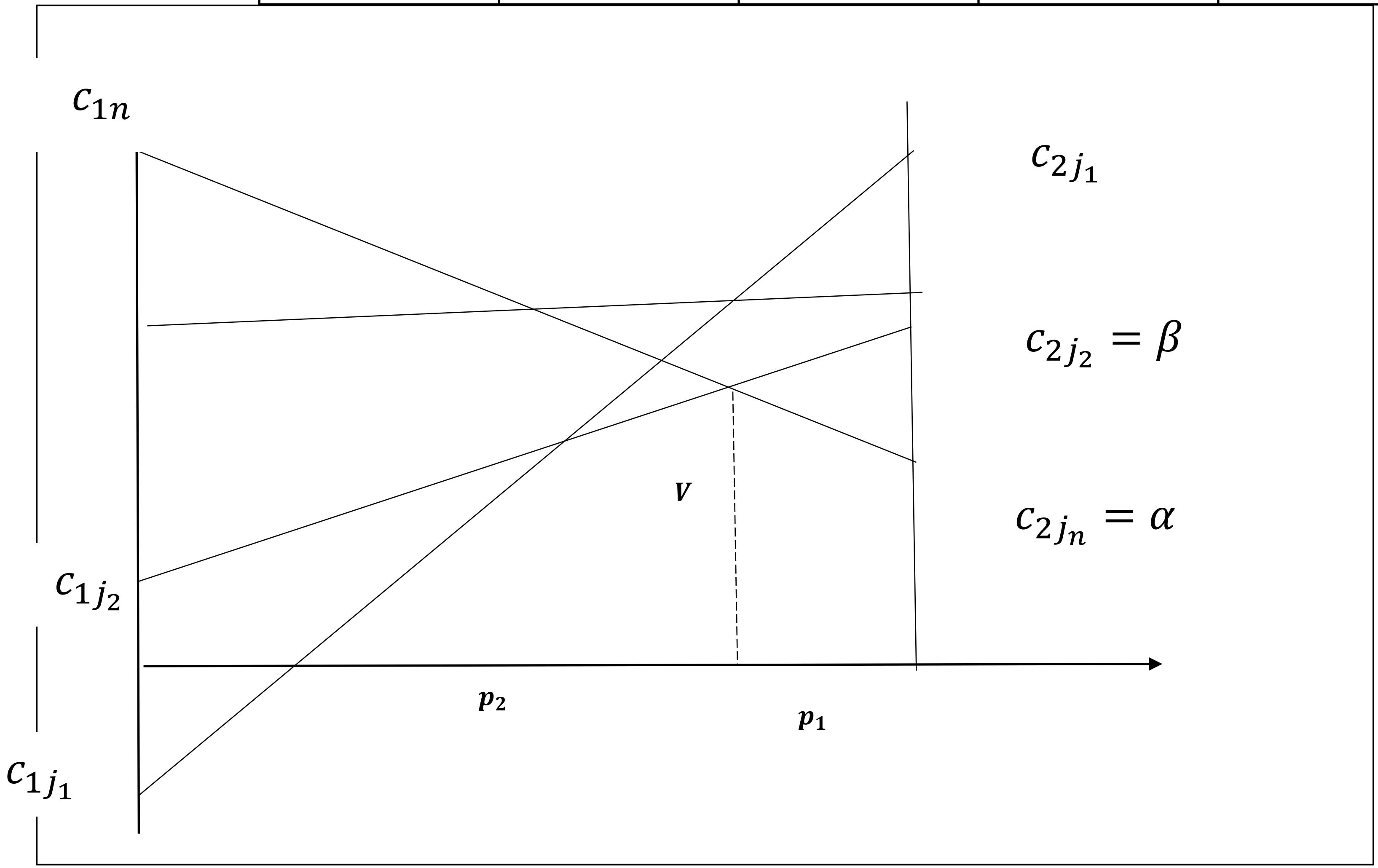
$$V_1 = c_{11}p_1 + c_{21}p_2$$

$$V_2 = c_{12}p_1 + c_{22}p_2$$



Игра 2 x N

	B_1	B_2	B_3	…	B_n
A_1	c_{11}	c_{12}	c_{13}	…	c_{1n}
A_2	c_{21}	c_{22}	c_{23}	…	c_{2n}



$$\alpha \le V \le \beta$$

Игра 2 x N

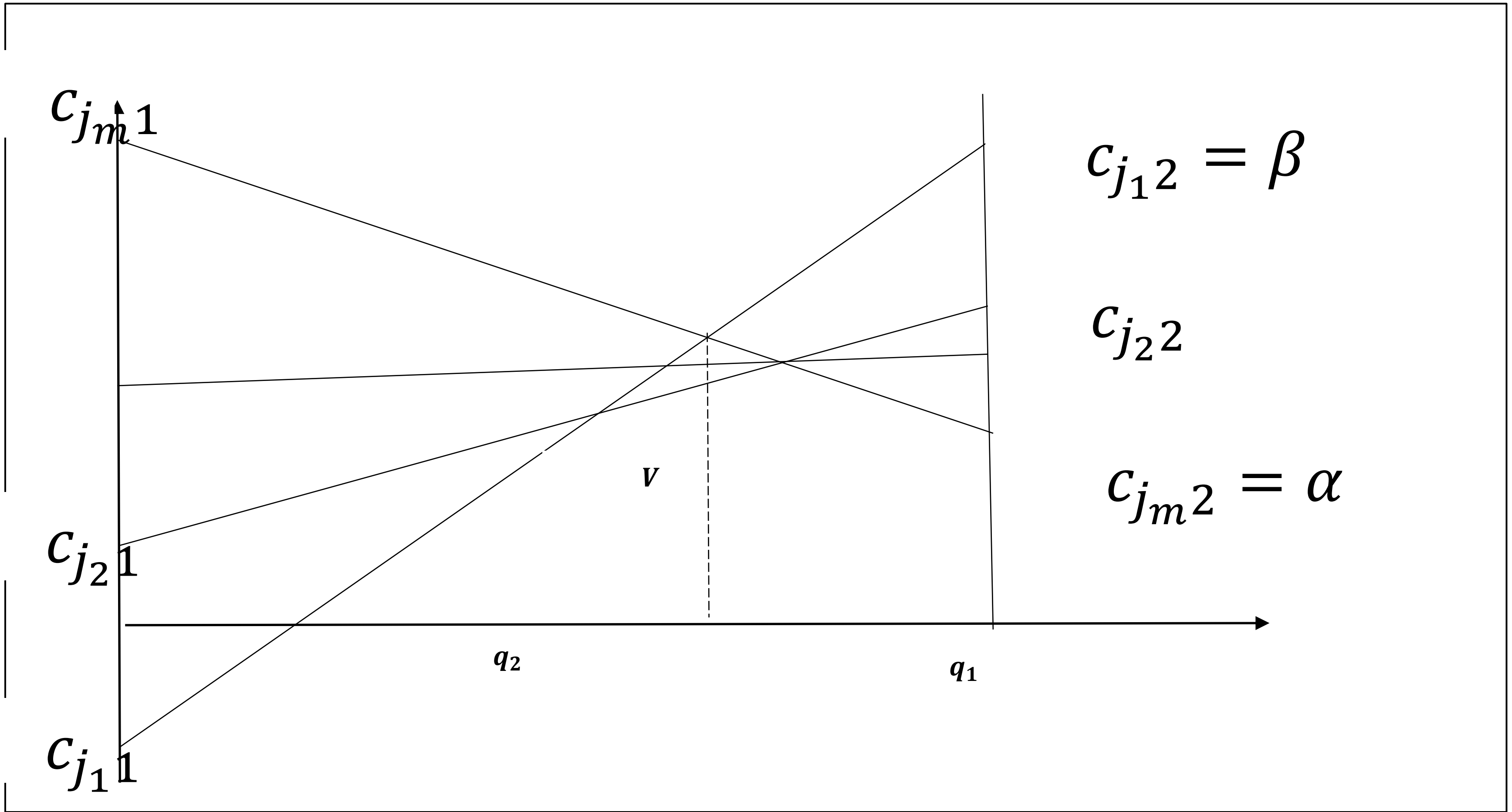
$$p_1 = \frac{c_{2j} - c_{2k}}{c_{1k} + c_{2j} - (c_{1j} + c_{2k})};$$

$$p_2 = \frac{c_{1k} - c_{1j}}{c_{1k} + c_{2j} - (c_{1j} + c_{2k})};$$

$$V = \frac{c_{1k}c_{2j} - c_{1j}c_{2k}}{c_{1k} + c_{2j} - (c_{1j} + c_{2k})}$$

Игра M x 2

	B_1	B_2
A_1	c_{11}	c_{12}
A_2	c_{21}	c_{22}
…	…	…
A_m	c_{m1}	c_{m2}



Игра М х 2

$$q_{1`} = \frac{c_{\mathrm{j2}} - c_{\mathrm{k2}}}{c_{\mathrm{k1}} + c_{\mathrm{j2}} - (c_{\mathrm{k2}} + c_{\mathrm{j1}})};$$

$$q_2 = \frac{c_{\mathrm{k1}} - c_{\mathrm{j1}}}{c_{\mathrm{k1}} + c_{\mathrm{j2}} - (c_{\mathrm{k2}} + c_{\mathrm{j1}})};$$

$$V = \frac{c_{\mathrm{j2}} c_{\mathrm{k1}} - c_{\mathrm{k2}} c_{\mathrm{j1}}}{c_{\mathrm{k1}} + c_{\mathrm{j2}} - (c_{\mathrm{k2}} + c_{\mathrm{j1}})}$$

Игра M x N

$$c_{11}p_1 + c_{21}p_2 + \cdots + c_{m1}p_m \geq V$$
$$c_{12}p_1 + c_{22}p_2 + \cdots + c_{m2}p_m \geq V$$
$$\cdots$$
$$c_{1n}p_1 + c_{2n}p_2 + \cdots + c_{mn}p_m \geq V$$

$$x_i = \frac{p_i}{V}$$

$$c_{11}x + c_{21}x_2 + \cdots + c_{m1}x_m \geq 1$$
$$c_{12}x_1 + c_{22}x_2 + \cdots + c_{m2}x_m \geq 1$$
$$\cdots$$
$$c_{1n}x_1 + c_{2n}x_2 + \cdots + c_{mn}x_m \geq 1$$

$$x_1 + x_2 + \cdots + x_m = \frac{1}{V}$$

$$x_1 + x_2 + \cdots + x_m = Z$$

$$Z \to min$$

$$\Rightarrow \text{ЛП}$$

```
W:1·x_1+1·x_2+1·x_3;
e1:2·x_1+4·x_2+1·x_3>=1;
e2:3·x_1+2·x_2+3·x_3>=1;
e3:1·x_1+2·x_2+4·x_3>=1;
minimize_lp(W,[e1,e2,e3]),nonegative_lp=true;
```

(%o13) *C:/maxima-5.42.1/share/maxima/5.42.1/share/simplex/simplex.mac*

(W) $x_3+x_2+x_1$

(e1) $x_3+4x_2+2x_1\geq 1$

(e2) $3x_3+2x_2+3x_1\geq 1$

(e3) $4x_3+2x_2+x_1\geq 1$

(%o18) $[\frac{11}{28},[x_3=\frac{1}{7},x_2=\frac{5}{28},x_1=\frac{1}{14}]]$

```
load(simplex);
W:1·y_1+1·y_2+1·y_3;
e1:2·y_1+3·y_2+1·y_3<=1;
e2:4·y_1+2·y_2+2·y_3<=1;
e3:1·y_1+3·y_2+4·y_3<=1;
maximize_lp(W,[e1,e2,e3]),nonegative_lp=true;
```

(%o19) *C:/maxima-5.42.1/share/maxima/5.42.1/share/simplex/simplex.mac*

(W) $y_3+y_2+y_1$

(e1) $y_3+3y_2+2y_1\leq 1$

(e2) $2y_3+2y_2+4y_1\leq 1$

(e3) $4y_3+3y_2+y_1\leq 1$

(%o24) $[\frac{11}{28},[y_3=\frac{1}{28},y_2=\frac{1}{4},y_1=\frac{3}{28}]]$


```
plot2d([1-2·x-4·y, 0.333-1·x-0.66·y, 0.25-0.25·x-0.5·y], [x,0,1], [y,0,1], [plot_format,gnuplot])$
```