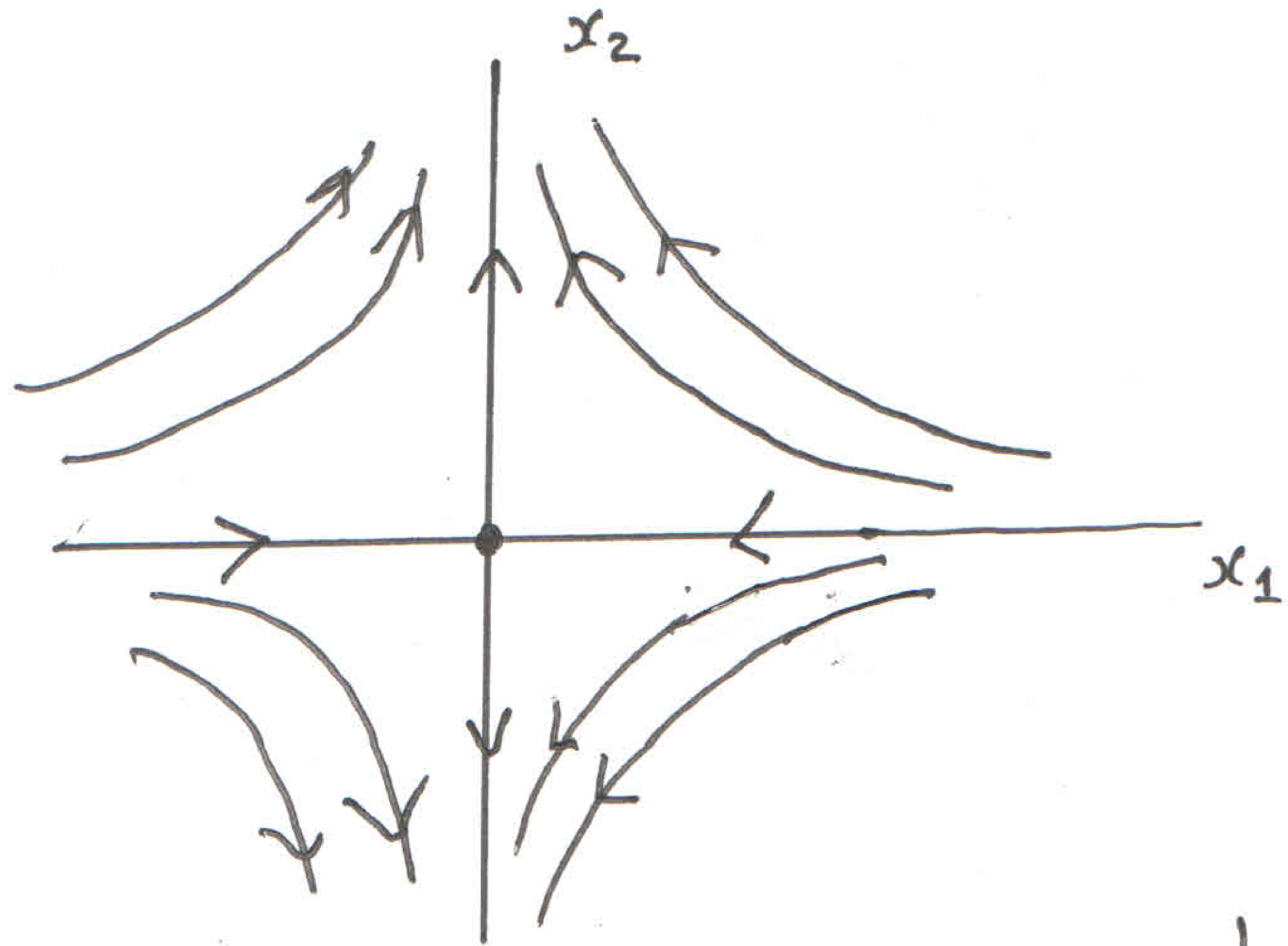
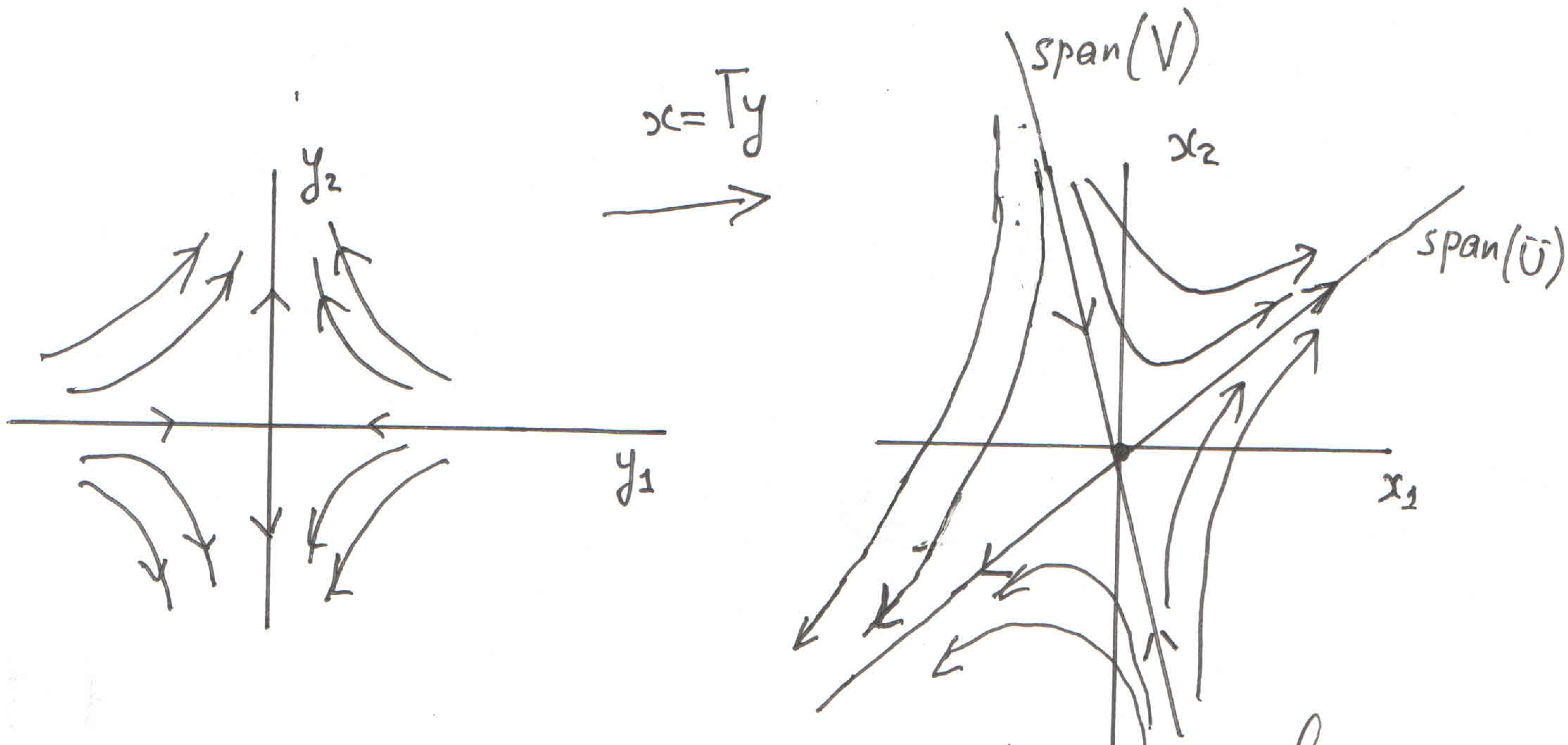


<u>fig. 6.1</u> The phase portrait of the system $x_1' = \lambda_1 x_1$, $x_2' = \lambda_2 x_2$, where $\lambda_1 < 0$, $\lambda_2 > 0$ (standard saddle)



<u>fig. 6.2</u> From standard to general saddle: the phase portrait of $x' = Ax$, where A has a positive eigenvalue and a negative eigenvalue. $\bar{U}$ is an eigenvector corresponding to positive eigenvalue, V is an eigenvector corresponding to negative eigenvalue.

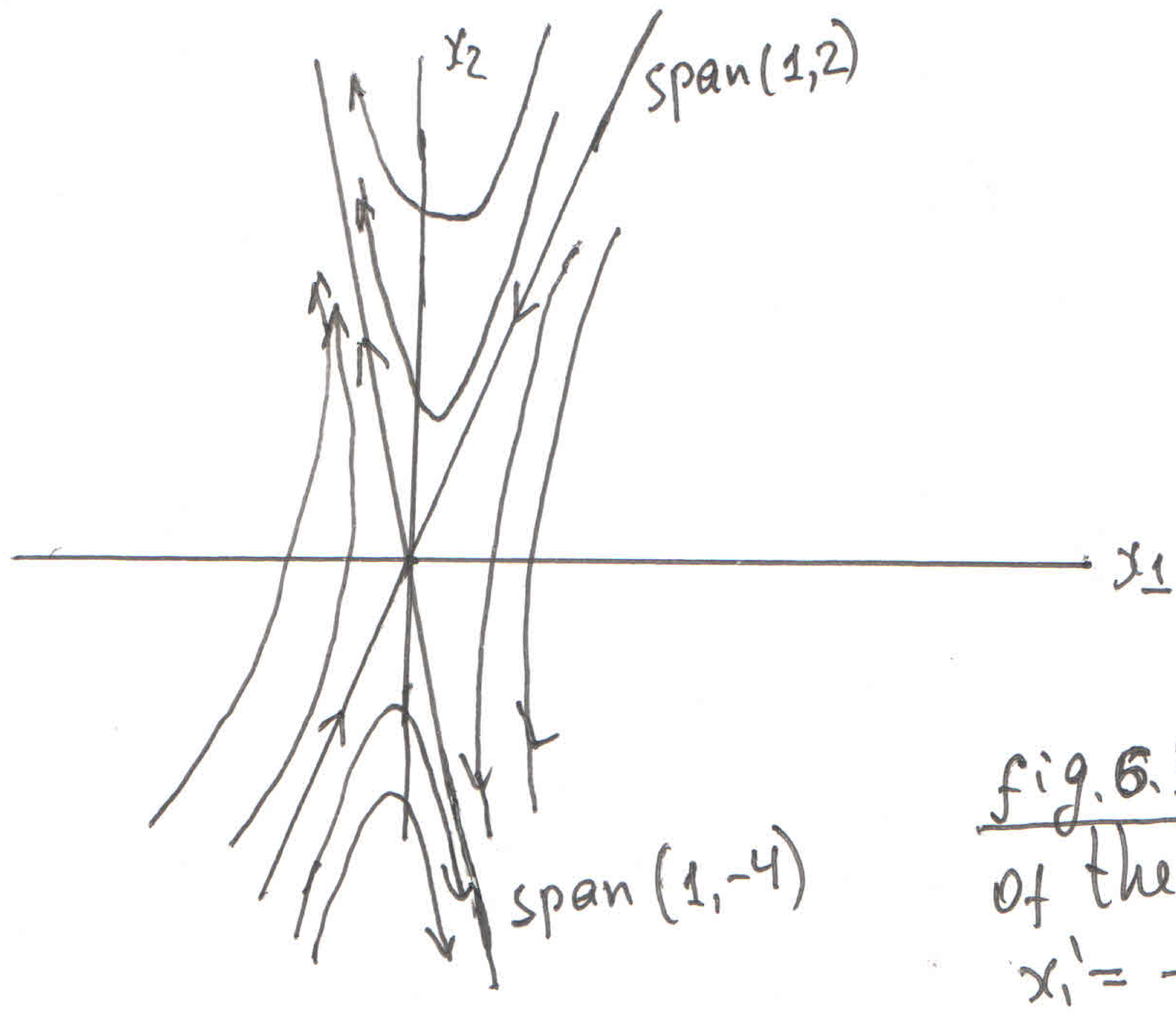


fig.6.3. The phase portrait of the system
$x_1' = -x_2, \; x_2' = -8x_1 + 2x_2.$

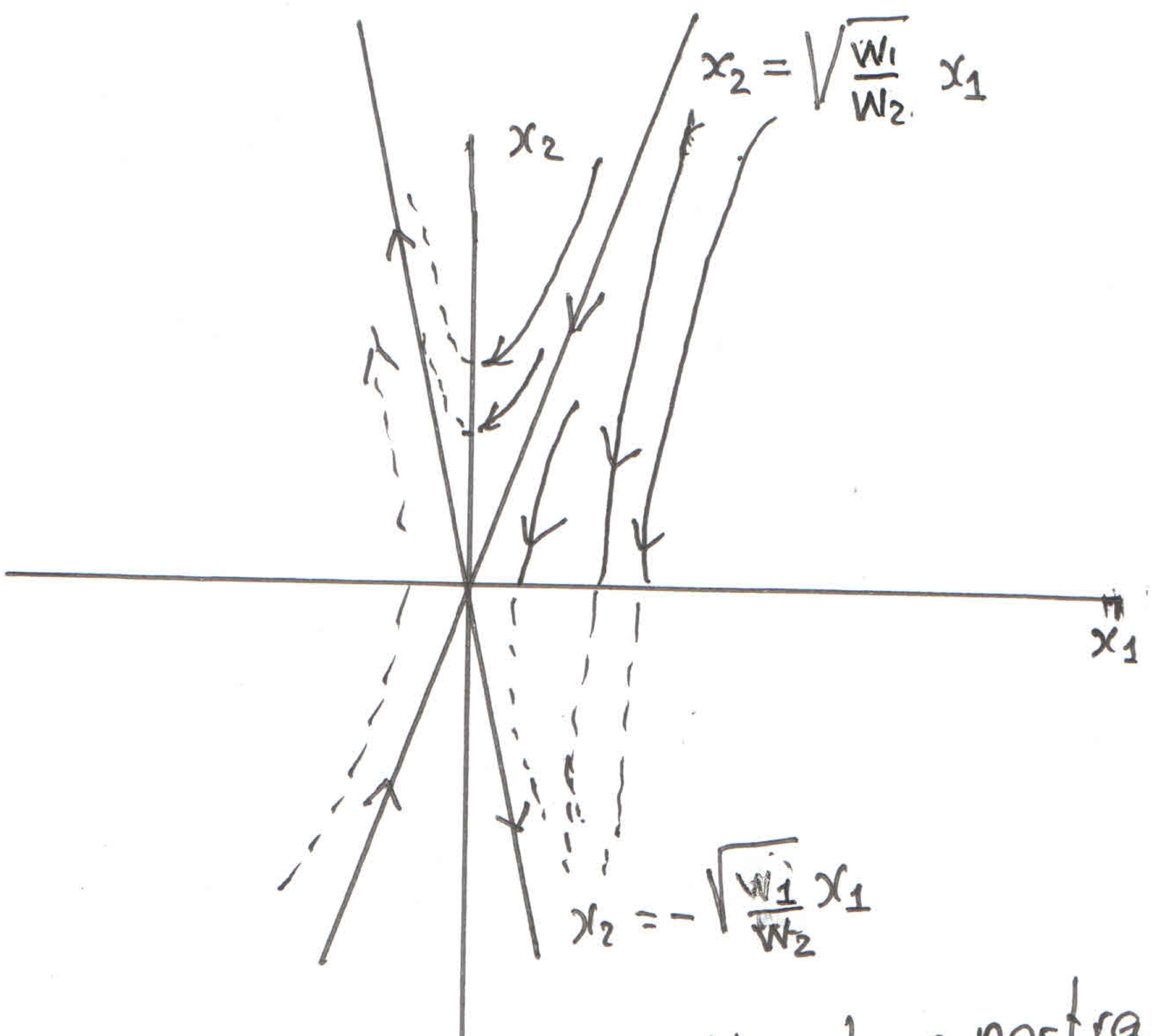


fig.6.4 A part of the phase portrait (in the first quarter of the (x_1, x_2)-plane for the system $x_1' = -kW_2x_2$, $x_2' = -kW_1x_1$ describing a fight between two armies. The first army wins if and only if the point $(x_1(0), x_2(0)) = (S_1, S_2)$ is located <u>below</u> the line $x_2 = \sqrt{\frac{W_1}{W_2}}\, x_1$.

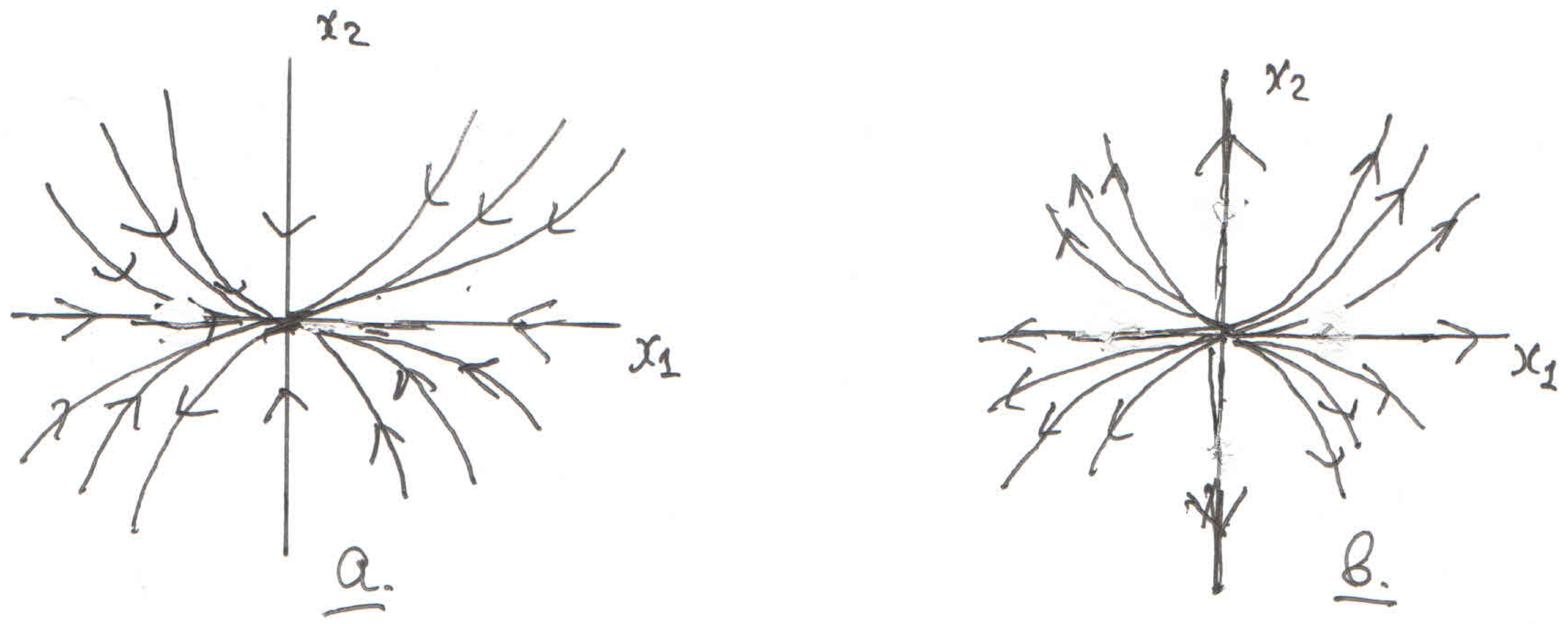
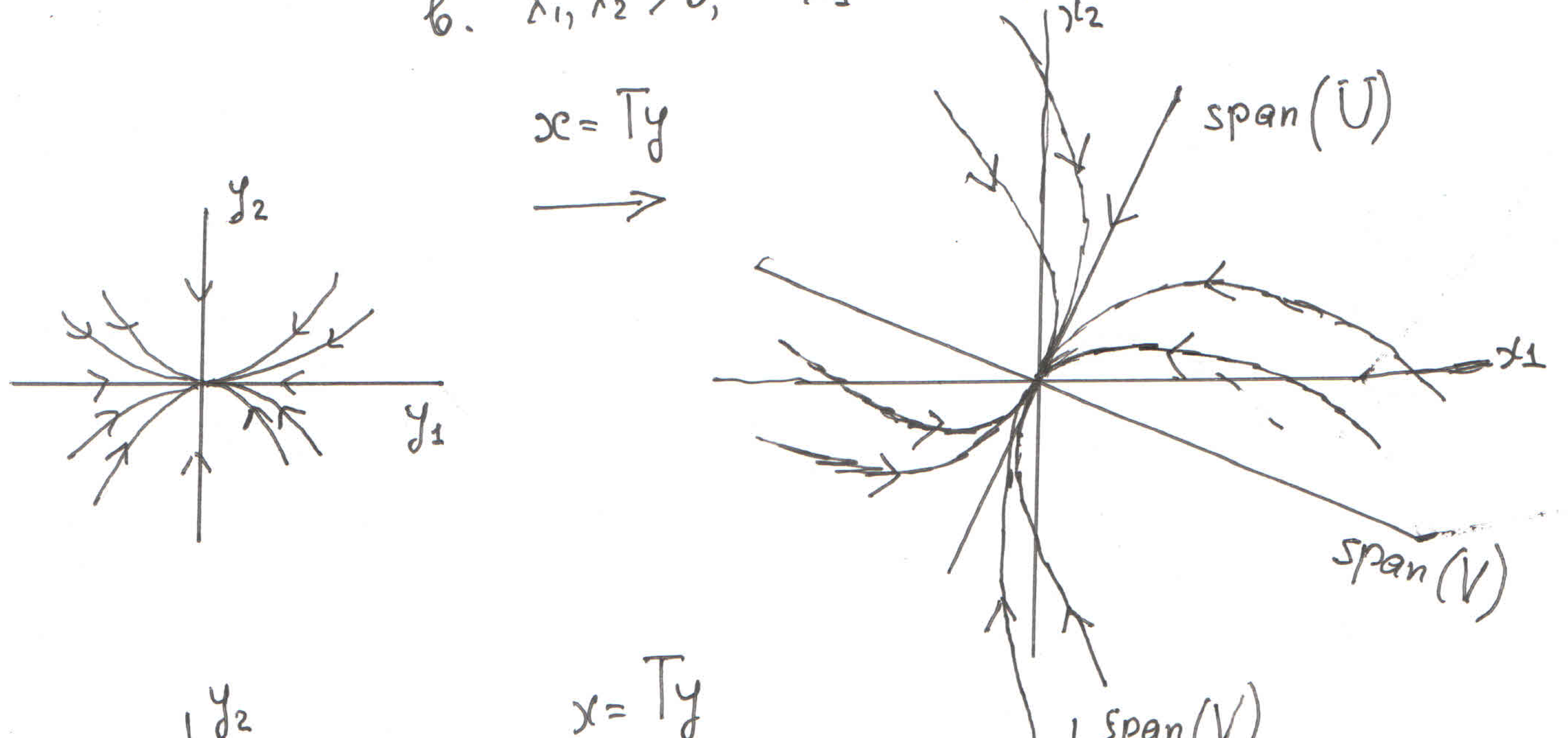


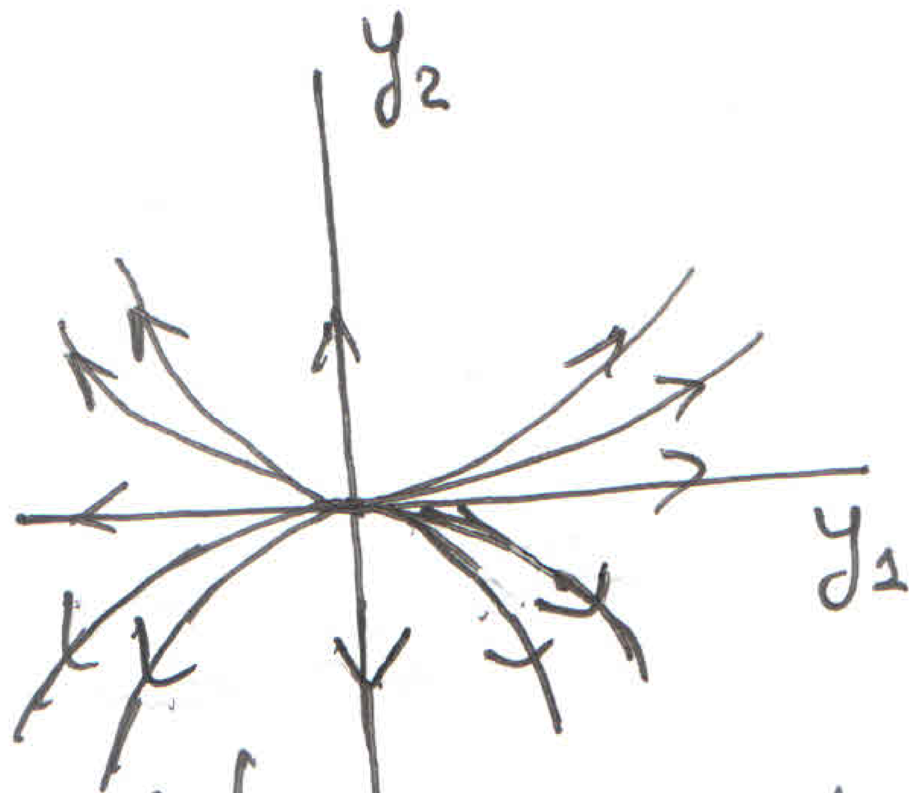
fig. 6.5 The phase portrait of the system

$x_1' = \lambda_1 x_1$, $x_2' = \lambda_2 x_2$ in the case

a. $\lambda_1, \lambda_2 < 0$, $|\lambda_1| < |\lambda_2|$ (standard stable node)

b. $\lambda_1, \lambda_2 > 0$, $\lambda_1 < \lambda_2$ (standard unstable node)





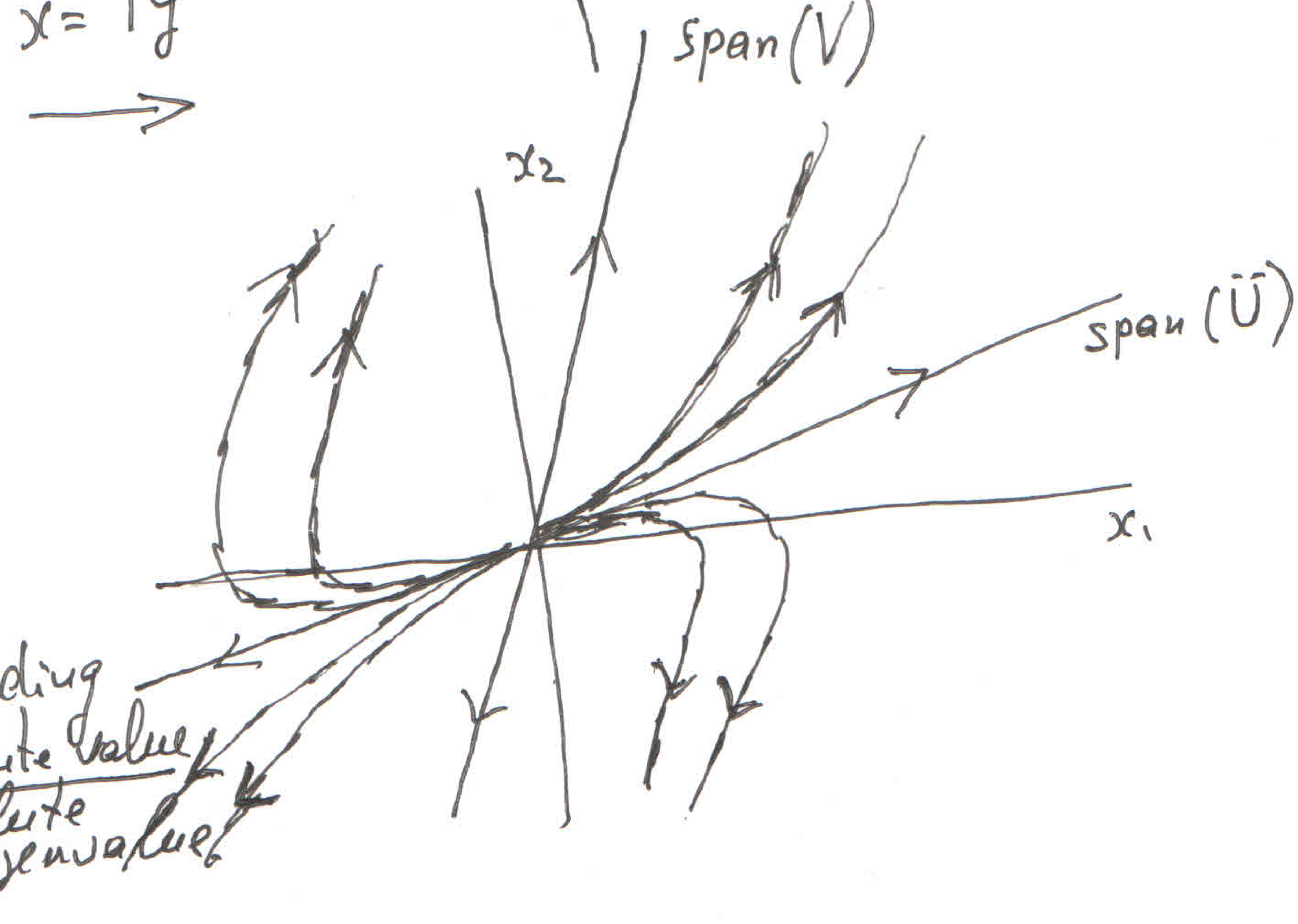


fig. 6.6 From standard stable or unstable node to general node.
$\bar{U}$ is eigenvector corresponding to eigenvalue whose absolute value is smaller than the absolute value of the other eigenvalue.

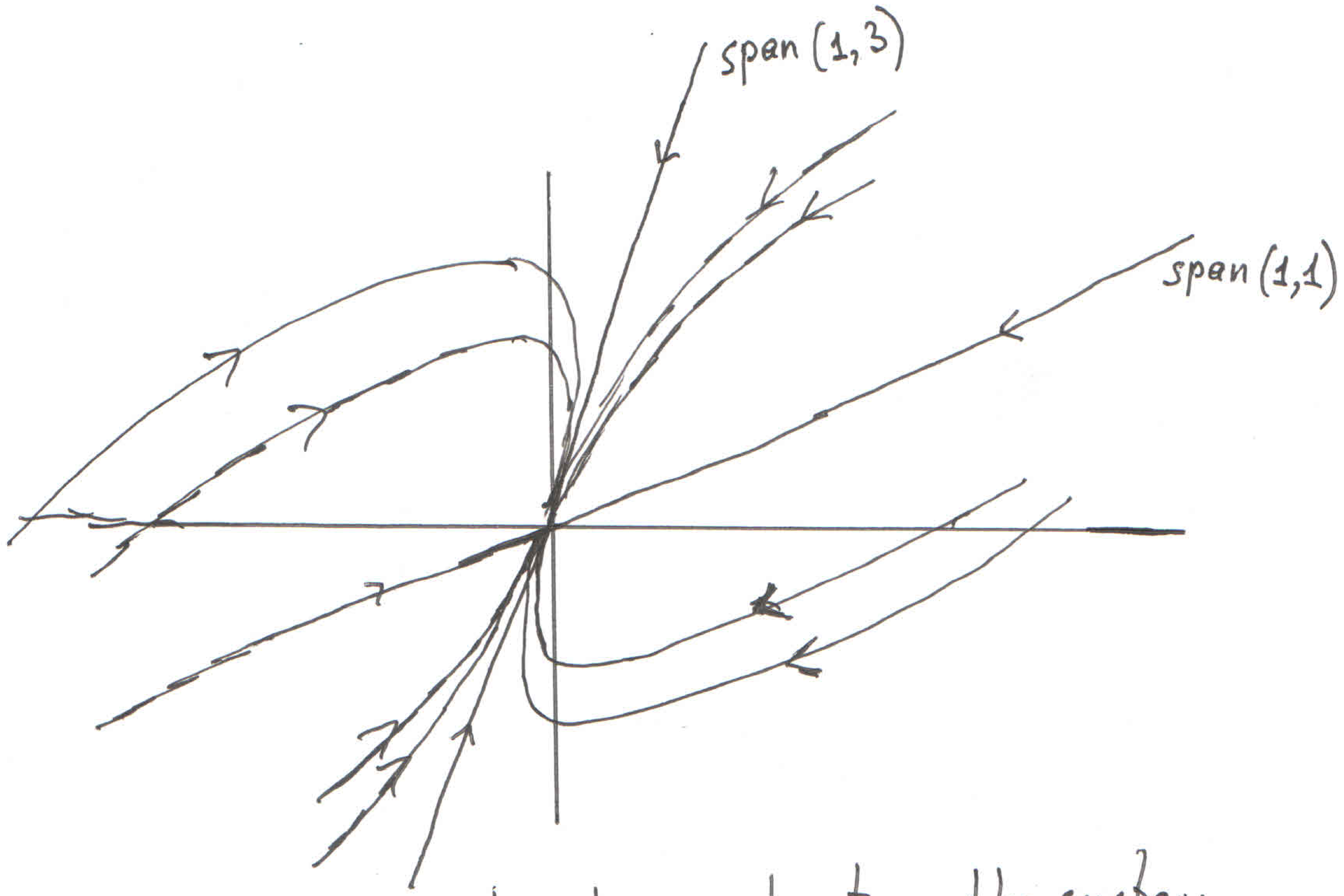


fig. 6.7. The phase portrait of the system
$x_1' = -6x_1 + x_2, \quad x_2' = -3x_1 - 2x_2.$

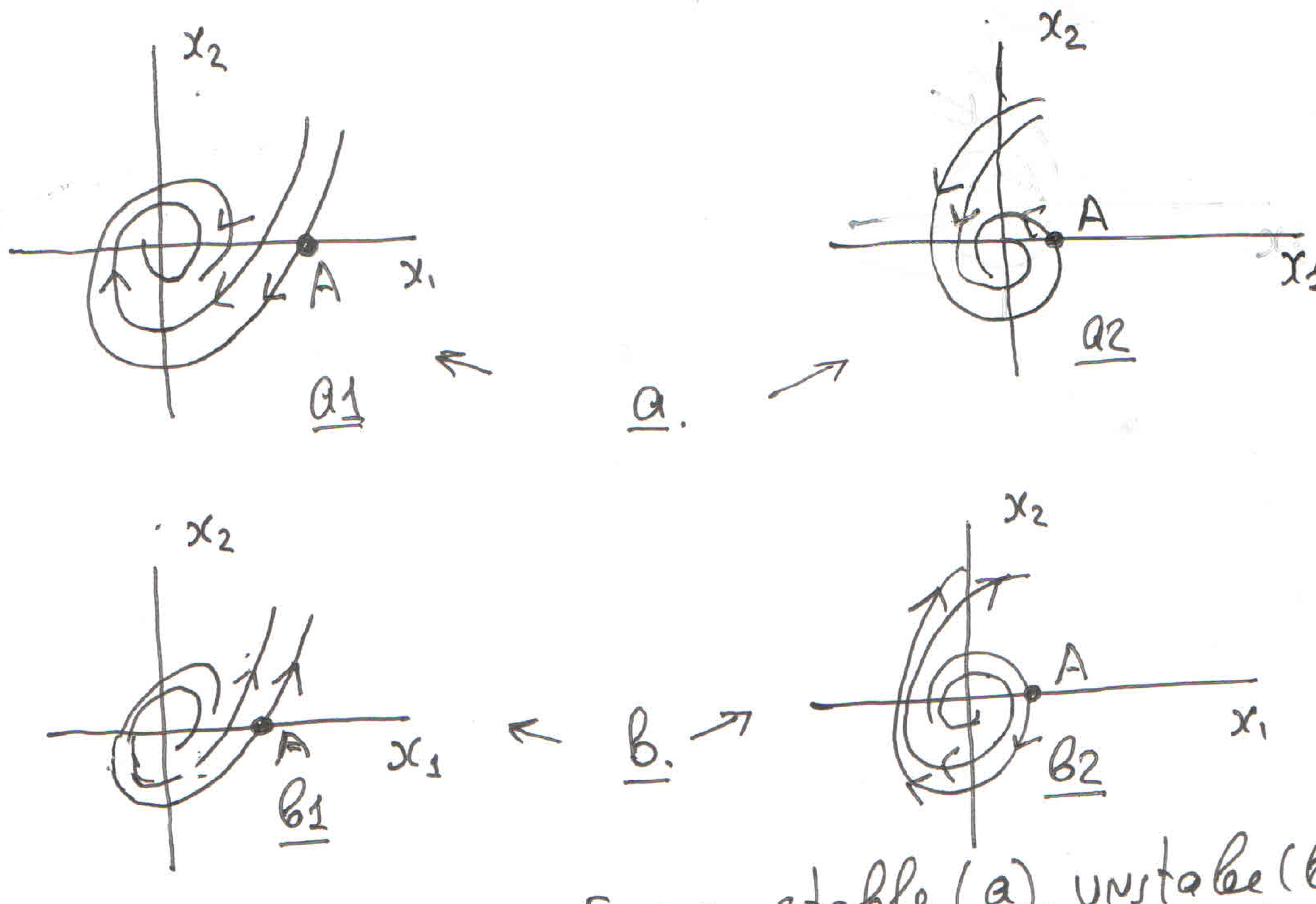


fig. 6.8. Focus: stable (a), unstable (b).
In both cases the spirals can get twisted/untwisted clockwise or anticlockwise.

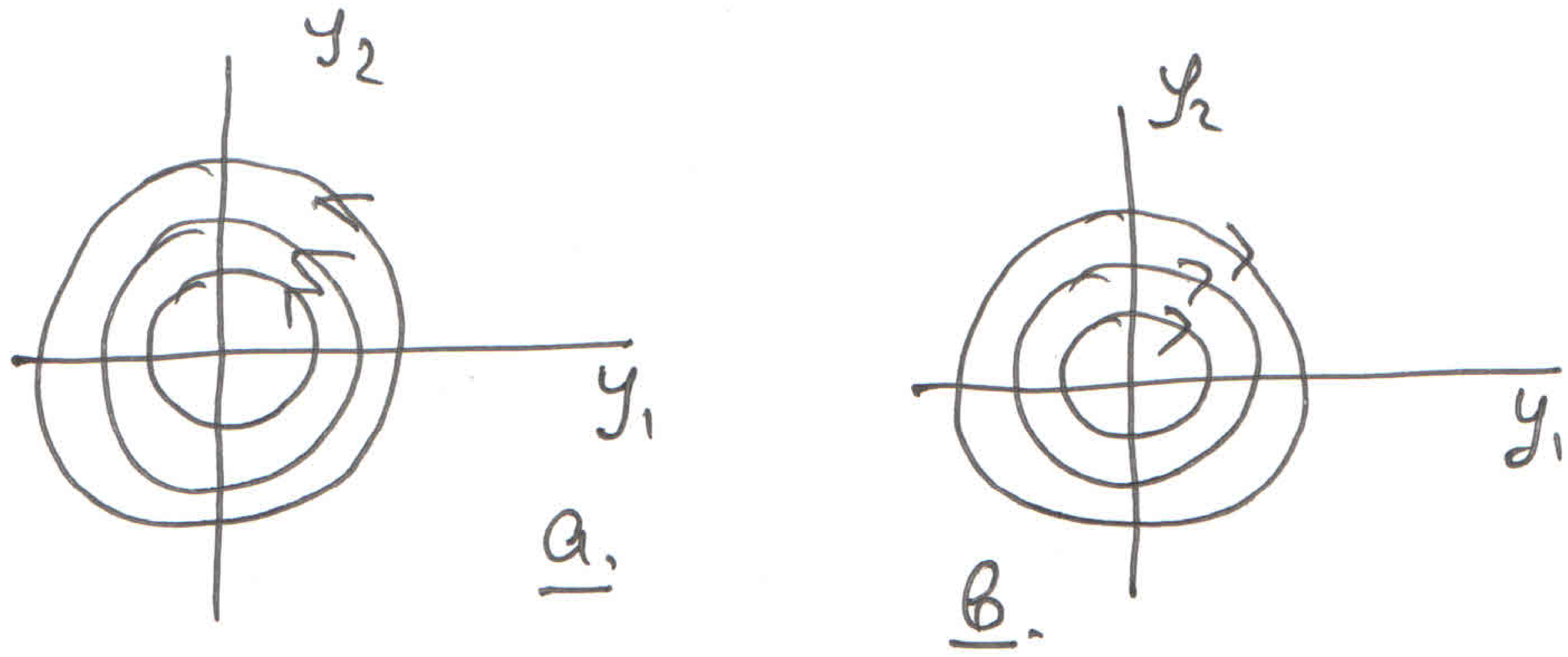


fig. 5.9. The phase portrait of the system $y_1' = \beta y_2$, $y_2' = -\beta y_1$ (standard center).

a. the case $\beta < 0$

b. the case $\beta > 0$.

The phase curves are described by the equation $y_1^2 + y_2^2 = \text{const}$.

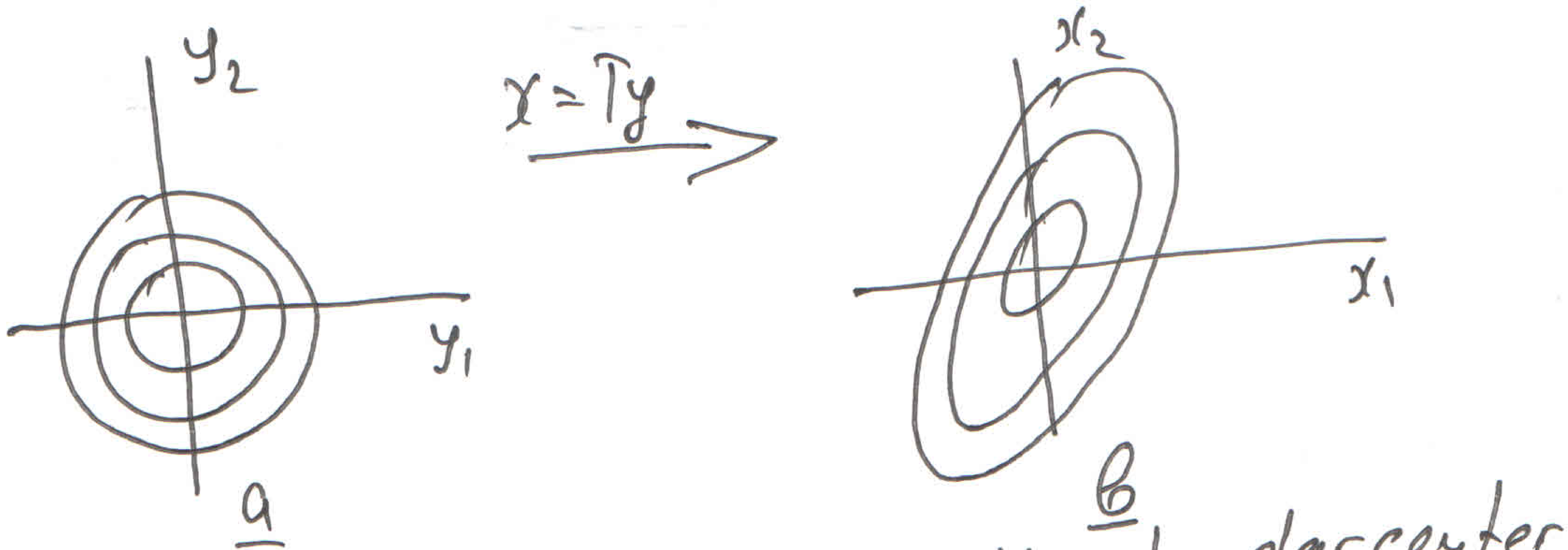


fig. 5.10. From the standar center (a) to the general center (b).

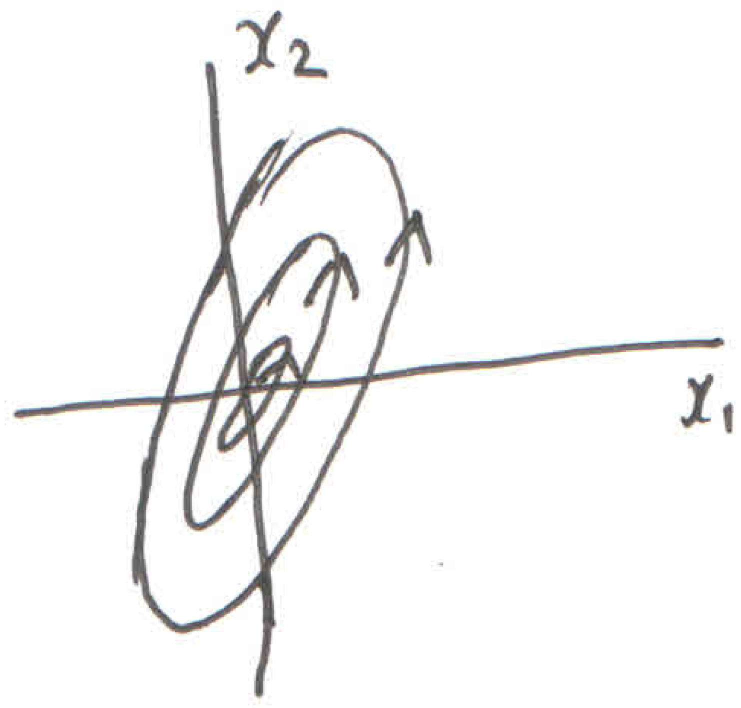


fig. 5.11 The phase portrait of the system $x' = \begin{pmatrix} 2 & -1 \\ 8 & -2 \end{pmatrix} x$.