



Chapter 7

Today, we are going to do some *qualitative analysis* of systems of ODEs. To understand what this means, it is best to proceed by means of an example.

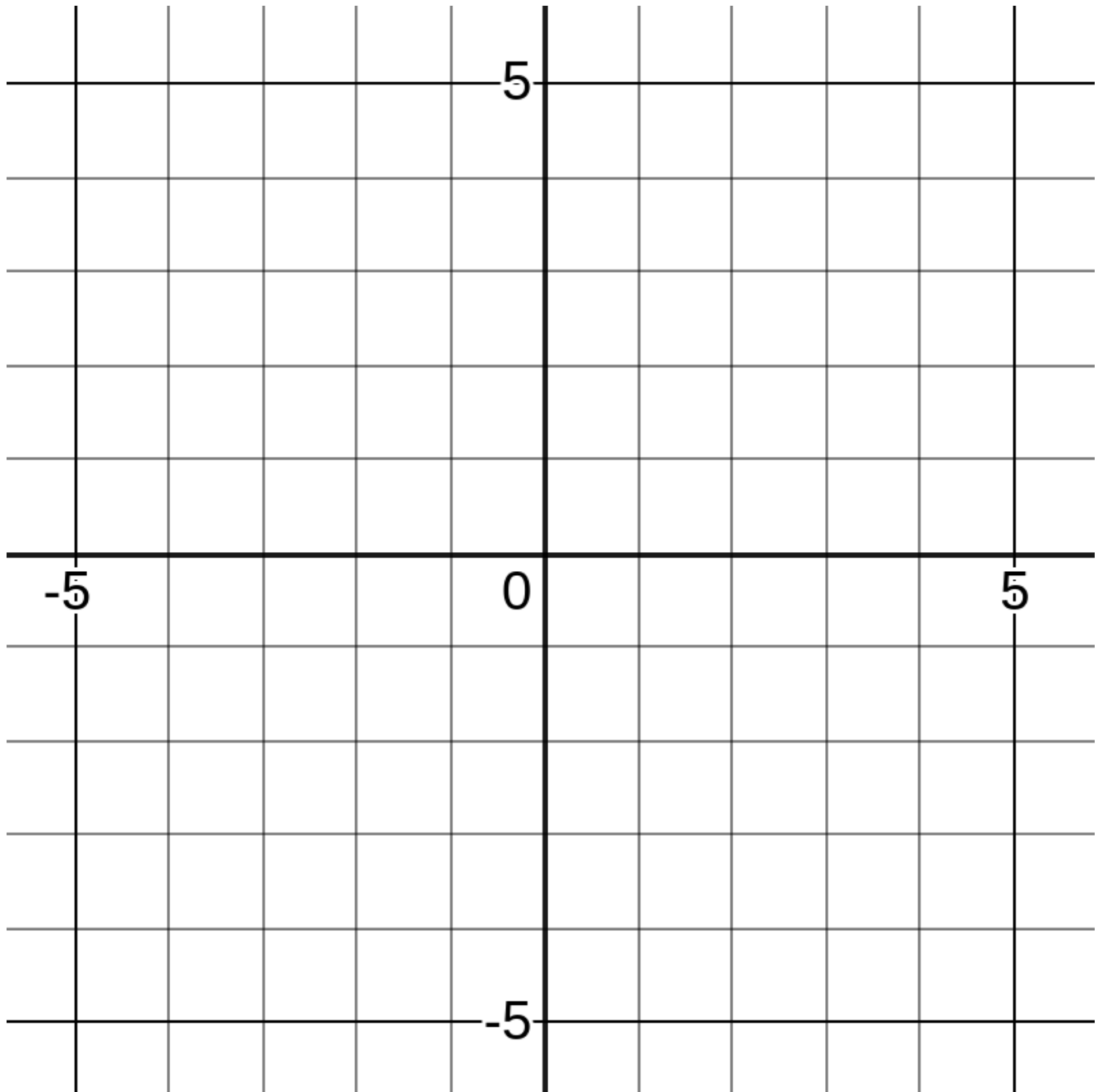
Consider the system:

$$\mathbf{x}'(t) = \begin{pmatrix} 1 & 1 \\ 4 & 1 \end{pmatrix} \mathbf{x}(t).$$

Sketch some solution curves in the (x_1, x_2) plane.



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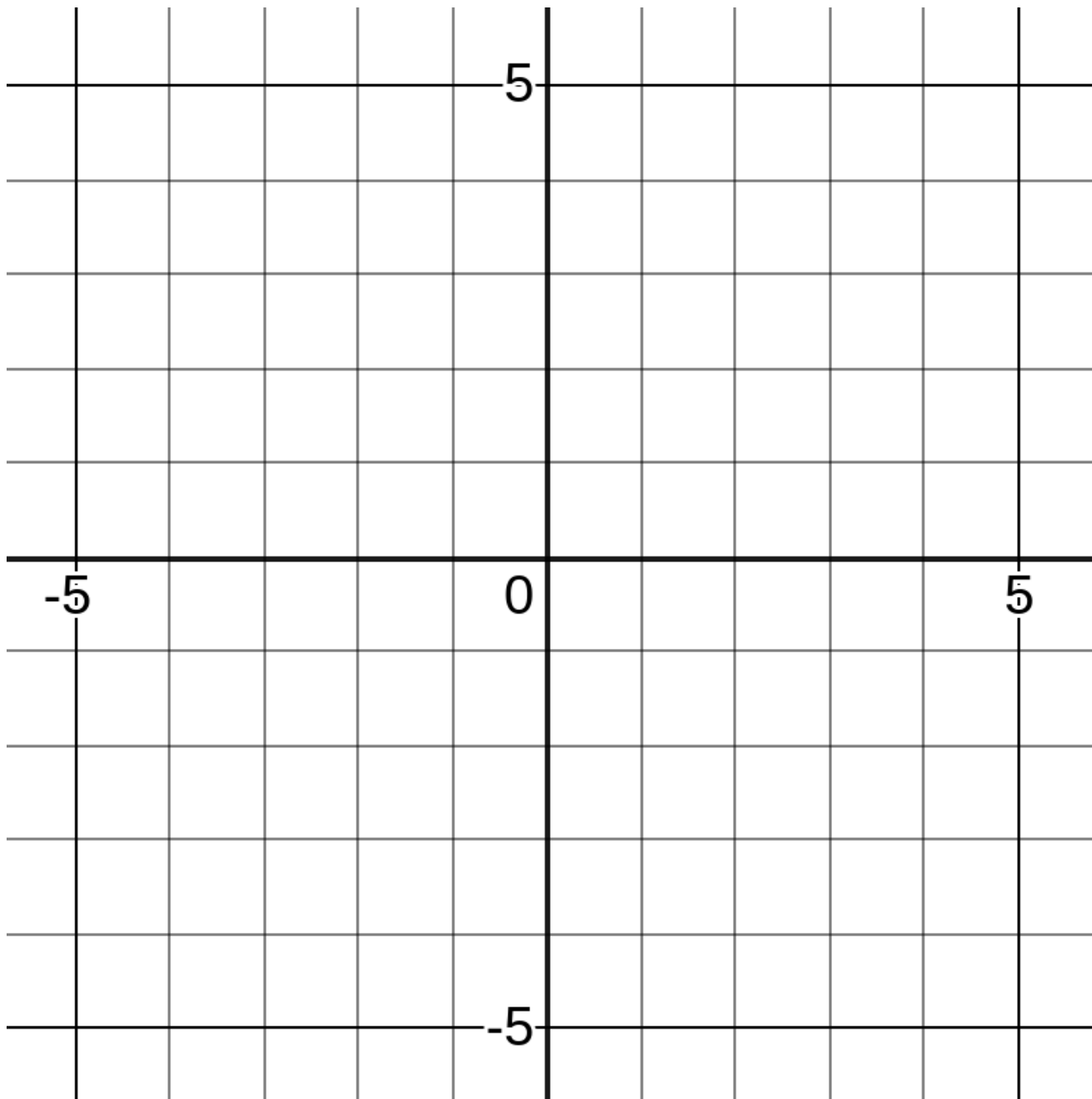




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Do the same analysis with the system:

$$x'(t) = \begin{pmatrix} -3 & \sqrt{2} \\ \sqrt{2} & -2 \end{pmatrix} x(t).$$

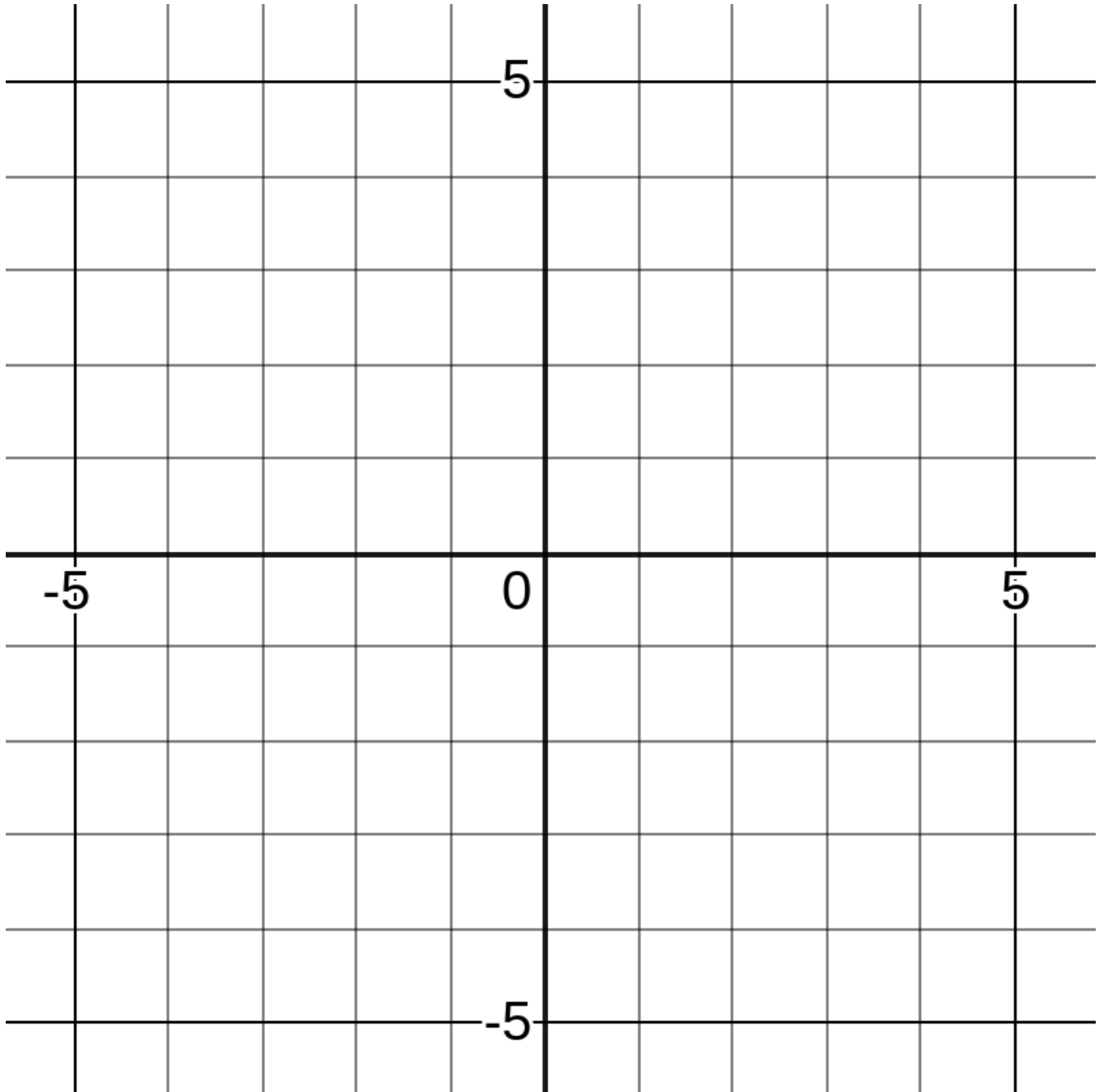




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Do the same analysis with the system:

$$\mathbf{x}'(t) = \begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix} \mathbf{x}(t).$$

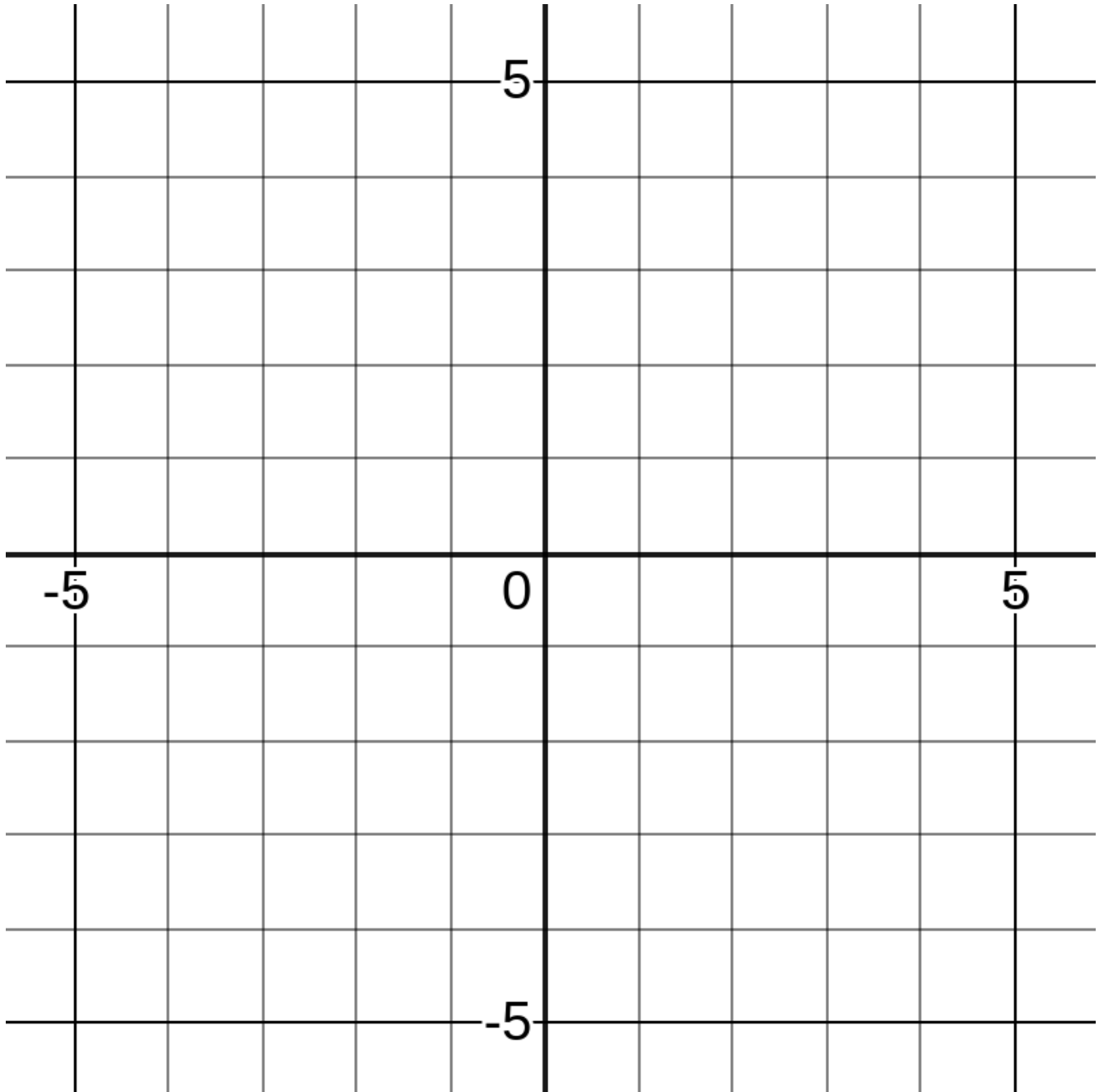




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Do the same analysis with the system:

$$\mathbf{x}'(t) = \begin{pmatrix} 2 & -5 \\ 1 & -2 \end{pmatrix} \mathbf{x}(t).$$





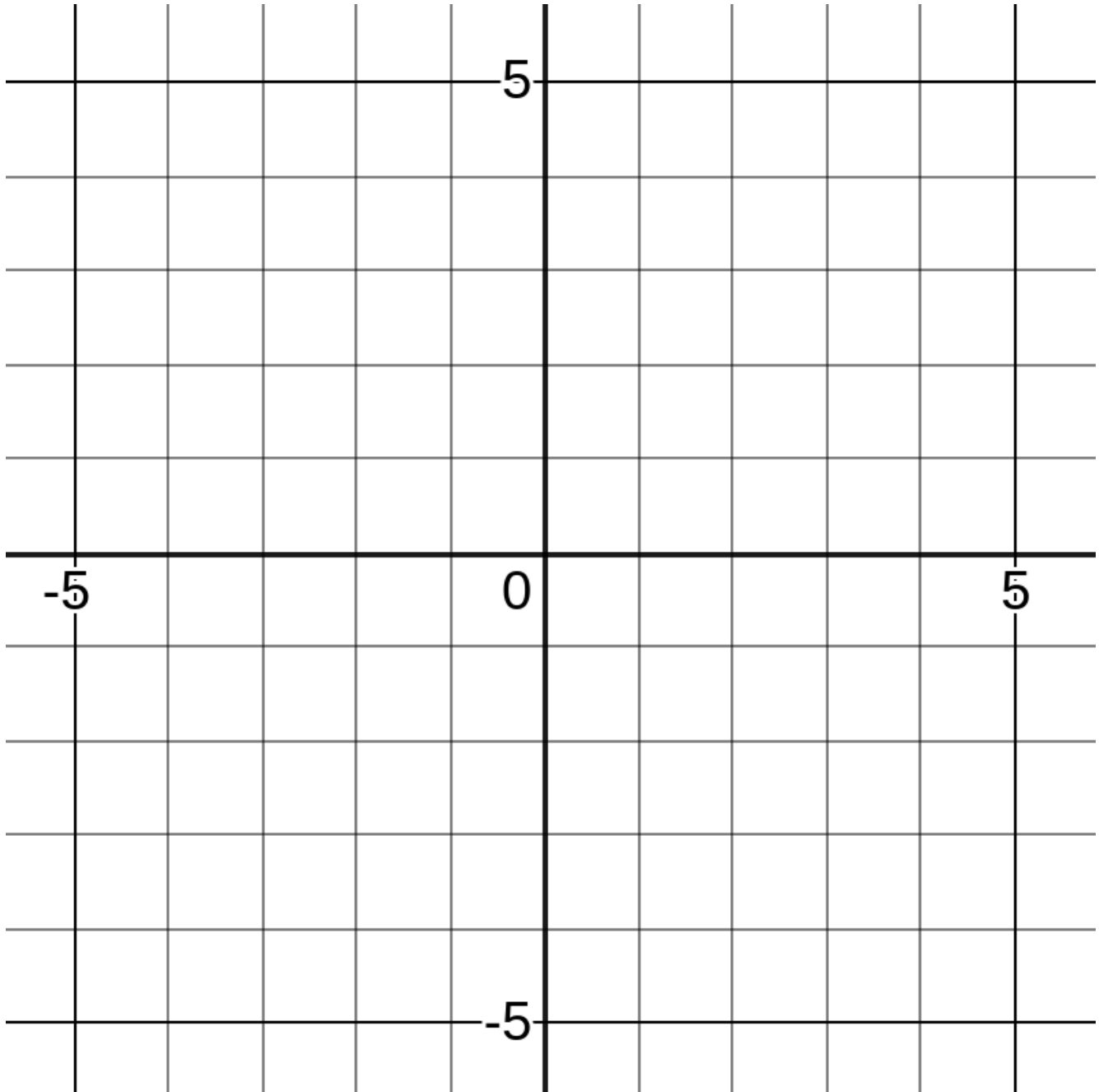
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Do the same analysis with the system:

$$\mathbf{x}'(t) = \begin{pmatrix} 3 & -2 \\ 4 & -1 \end{pmatrix} \mathbf{x}(t).$$





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