

1 Check that the vector $\mathbf{v} = \begin{pmatrix} 1 - i \\ 2 \end{pmatrix}$ is an eigenvector of the matrix $A = \begin{pmatrix} 0 & 1 \\ -2 & 2 \end{pmatrix}$.

To what eigenvalue λ does this eigenvector correspond?

Problems **1**, **13**, **16**, **22**, **41**, **59** of Section 9.2; **10**, **12**, **16**, **21** of Section 9.3; **1** of Section 9.5. However, the problems in the test will be fewer, and not so “atomized” as these problems: say, not only about the form of the general solution (which is treated in Section 9.2), but also about identifying the type of the equilibrium point (Section 9.3), and about stability/instability etc. (Section 9.5).

∞ (i) Sketch the nullclines for the system

$$\begin{cases} x' = x(4y - 5), \\ y' = y(3 - x). \end{cases}$$

Use a distinctive marking for each nullcline so they can be distinguished.

(ii) Find the equilibrium points of the system. Check that $(3, 5/4)$ is one of them.

(iii) Write the linearization of this nonlinear system at the point $(3, 5/4)$ (denoting $u = x - 3$, $v = y - 5/4$).

This is a modified problem **5** of Section 10.1. You should know how a system is linearized not only from this Section (see formula (1.12)), but also from your Project #1.