

Assignment 9: Classification of Equilibrium Points

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An **equilibrium point** (x_0, y_0) of the system of differential equations $\begin{cases} \frac{dx}{dt} = f(x, y) \\ \frac{dy}{dt} = g(x, y) \end{cases}$ is a point which satisfies $\begin{cases} f(x_0, y_0) = 0 \\ g(x_0, y_0) = 0 \end{cases}$
For the 2×2 system of linear differential equations

$$\mathbf{x}' = A\mathbf{x}$$

in which the matrix of coefficients A has eigenvalues λ_1 and λ_2 , the equilibrium point $(0, 0)$ is classified according to the relations between λ_1 and λ_2 .

In this assignment, find eigenvalues, eigenvectors of A , solve the system and classify the equilibrium point $(0, 0)$ for the each system $\mathbf{x}' = A\mathbf{x}$, using Maple, if:

$$i) A = \begin{pmatrix} -1 & -1 \\ 5 & -3 \end{pmatrix};$$

$$ii) A = \begin{pmatrix} 10 & -1 \\ 6 & 8 \end{pmatrix};$$

$$iii) A = \begin{pmatrix} -3/7 & 1/3 \\ -1 & 3/7 \end{pmatrix},$$

Value of this assignment is 4 points (1 point is equal to 1 percent of your final mark).