1. Consider the system \( \frac{dx}{dt}, \frac{dy}{dt} = M(x, y) \) where \( M \) is the matrix given by
\[
M = \begin{pmatrix}
-2 & -2 \\
4 & -6
\end{pmatrix}.
\]
One eigenvalue of \( M \) is \( \lambda_1 = -4 - 2i \) with corresponding eigenvector \( \vec{v}_1 = (1, 1 + i) \).

a. Give the complex valued solution \( Y_{\text{complex}}(t) \) to the system. Write out this solution in the form
\[
Y_{\text{complex}}(t) = \Re(Y_{\text{complex}})(t) + i \Im(Y_{\text{complex}})(t)
\]

b. Give the general solution to this system (see next page)
c. What is the value of the vector field given by the system at the point \((x = 1, y = 0)\)?

d. Sketch the phase portrait for this system. To help you, plot the vector that you calculated in (c) in your picture. What is the type of the equilibrium point at the origin?

Self evaluation: (Circle) Rate your level of understanding of the material on the quiz:

\[\text{Mastery} \quad \text{Developing} \quad \text{Not Yet}\]