Problems of Chemical Kinetics using *WolframAlpha*.

In these problems, you have to:

- Write the *rate matrix* (**K** matrix).
- Find the eigenvalues of the **K** matrix using the `Eigenvalues[]` function of *WolframAlpha*.
- Find the eigendecomposition of the **K** matrix using the `Diagonalize[]` function of *WolframAlpha*. Watch the cases (if any) when the **K** matrix is not diagonalizable.
- Find the matrix exponential $e^{\mathbf{K}t}$ using the `MatrixExp[]` function of *WolframAlpha*. Make sure you are really calling `MatrixExp[]` rather than `Exp[]`.
- Multiply the resulting $e^{\mathbf{K}t}$ matrix by an initial-concentration vector. Consider the case when only one reactant [A] is present ($[A]_0 \neq 0$, $[B]_0 = [C]_0 = \ldots = 0$) as well as the case when all reactants are present at the beginning: $[A]_0 \neq 0$, $[B]_0 \neq 0$, $[C]_0 \neq 0, \ldots$ *Hint:* this matrix-vector multiplication and the previous step ($e^{\mathbf{K}t}$ matrix calculation) can be done by *WolframAlpha* in a single step. Figure out yourself how.
- If possible, solve the original system of kinetic equations for the given initial concentrations directly, using the `Solve[]` function of *WolframAlpha*. Compare the results with those obtained previously by the matrix method.

The systems to do are the following ones:

1. A→B→C with different rate constants $k_1 \neq k_2$.
2. A→B→C with identical rate constants $k_1 = k_2 = k$.
3. A⇄B→C with rate constants k_1, k_{-1}, k_2.
4. A⇄B→C with indentical rate constants $k_1 = k_{-1} = k_2 = k$.
5. A→B⇄C with rate constants k_1, k_2, k_{-2}.
6. A→B, A⇄C with rate constants k_1, k_2, k_{-2}.
7. A→B→C→D with different rate constants $k_1 \neq k_2 \neq k_3$.
8. A→B→C with identical rate constants $k_1 = k_2 = k_3 = k$.