1. (5 pts) During a light rain, drops of water randomly hit people walking on the street. The number of people on the street that have not been hit by any water drops \( D(t) \) decreases at a rate proportional to how many of those people there still are: \( D' = -kD \) where \( k \) is a positive constant. The number of totally dry individuals was \( D_1 \) after \( t_1 \) minutes and it was \( D_2 \) after \( t_2 \) minutes. Express \( k \) in terms of \( D_1, D_2, t_1, \) and \( t_2 \).

\[
D(t) = D_0 e^{-kt} \\
D(t_1) = D_0 e^{-kt_1} = D_1 \\
D(t_2) = D_0 e^{-kt_2} = D_2 \\
\frac{D_1}{D_2} = e^{k(t_2-t_1)} \\
\ln \left( \frac{D_1}{D_2} \right) = k(t_2-t_1) \\
k = \frac{\ln(D_1/D_2)}{t_2-t_1}
\]

2. (10 pts) Given that the functions shown in the figure below are solutions to the equation \( y' = f(y) \), sketch as much of the phase line for the equation as can be determined from the solutions given:

- Indicate steady states and their stability using filled (stable) / empty (unstable) circles.
- Include arrows for direction of motion.
- Mark the locations of any inflection points on the phase line with a star above or below the point.
- If stability is not possible to determine for some steady state, write “stability undetermined” with an arrow pointing to that steady state.
- Sketch the graph of \( f(y) \) over the phase line.