Example. Consider the rate equation $y' = ky$, where $k$ is a constant.

(a) Determine the order of the differential equation and give an interpretation of the constant $k$.

(b) Find all values of the constants $C$ and $r$ such that $y(t) = Ce^{rt}$ is a solution of the rate equation.

\begin{itemize}
  \item[a)] The highest deriv. is $y' \Rightarrow$ Order of the d.e. = 1

  Interpretation: d.e. $\Rightarrow y' \propto y$ and $k =$ const. of proportionality

  For example: if $k > 0$ and $y > 0 \Rightarrow y' > 0$ so $y(t)$ increases

  if $k < 0$ and $y > 0 \Rightarrow y' < 0$ so $y(t)$ decreases

  \item[b)] Let $y(t) = Ce^{rt}$

  $y' = C re^{rt}$

  d.e. $\Rightarrow C re^{rt} = kCe^{rt}$ so $r = k$

  Solution $\Rightarrow y(t) = Ce^{kt}$, $C$ arbitrary
\end{itemize}