Exponential Growth and Inhibited Growth

a) The differential equation $\frac{dy}{dx} = ry$ describes a situation in which a population size y increases at a rate proportional to its size. Use separation of variables to find a solution to this equation.

b) The differential equation $\frac{dy}{dx} = ry(s - y)$ $(s > 0)$ describes change in a population which tends toward a fixed size s. For example, this might describe a population in which food or space is limited. Use separation of variables and the fact that $\int \frac{dy}{y(s-y)} = \frac{1}{s} \ln \left| \frac{y}{s-y} \right| + c$ to find a solution to this equation.

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