Let $y(t)$ be the unique solution to the initial value problem

$$y' = y(1 - y)(y - 2), \quad y(0) = y_0.$$

(a) If $y_0 = 0$ or $y_0 = 1$ or $y_0 = 2$, show that $y(t) = y_0$, for all $t$.

(b) If $y_0 < 0$ or $0 < y_0 < 1$, show that $y(t) \to 0$, as $t \to \infty$.

(c) If $1 < y_0 < 2$ or $y_0 > 2$, show that $y(t) \to 2$, as $t \to \infty$.

(This problem is worth two points if you solve it without actually solving the equation.)