Solution (#1684) The Lotka-Volterra equations read

$$\frac{\mathrm{d}F}{\mathrm{d}t} = -mF + aFR, \qquad \frac{\mathrm{d}R}{\mathrm{d}t} = bR - kFR.$$

Solution (i) If we set $F(t) = 0$, $R(t) = \varepsilon e^{bt}$ then we have

$$\frac{\mathrm{d}F}{\mathrm{d}t} = 0, \qquad -mF + aFR = 0;$$
$$\frac{\mathrm{d}R}{\mathrm{d}t} = b\varepsilon e^{bt}, \qquad bR - kFR = b\varepsilon e^{bt}.$$

(ii) If we set $F(t) = \varepsilon e^{-mt}$, $R(t) = 0$ then we have

$$\frac{\mathrm{d}F}{\mathrm{d}t} = -m\varepsilon e^{-mt}, \qquad -mF + aFR = -m\varepsilon e^{-mt};$$
$$\frac{\mathrm{d}R}{\mathrm{d}t} = 0, \qquad bR - kFR = 0.$$

It follows that the equilibrium point $(0, 0)$ is not stable. If we were to perturb the point $(0, 0)$ to $(0, \varepsilon)$ (by introducing only rabbits) then the rabbit population would increase exponentially.