方向場作圖求解常微分方程

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$$\dot{P}(t) = P(t)(\beta - \delta P) \tag{1}$$

Three cases of initial conditions:
Case 1: unreasonable

$$P(0) < 0$$

Case 2: grow to be saturated

$$0 < P(0) < \frac{\beta}{\delta}$$

Case 3: decay to be saturated

$$P(0) > \frac{\beta}{\delta}$$

general solution is :

$$P(t) = \frac{\beta}{\delta + [\frac{\beta}{P(0)} - \delta]e^{-\beta t}}$$

Asymptotic population= $\frac{\beta}{\delta}$.

$$dy/dx = xy, y(1) = 2 \tag{2}$$

$$dy/dx = x/y, y(1) = 0 \tag{3}$$

$$dy/dx = x^2 + y^2, y(0) = 1 \tag{4}$$