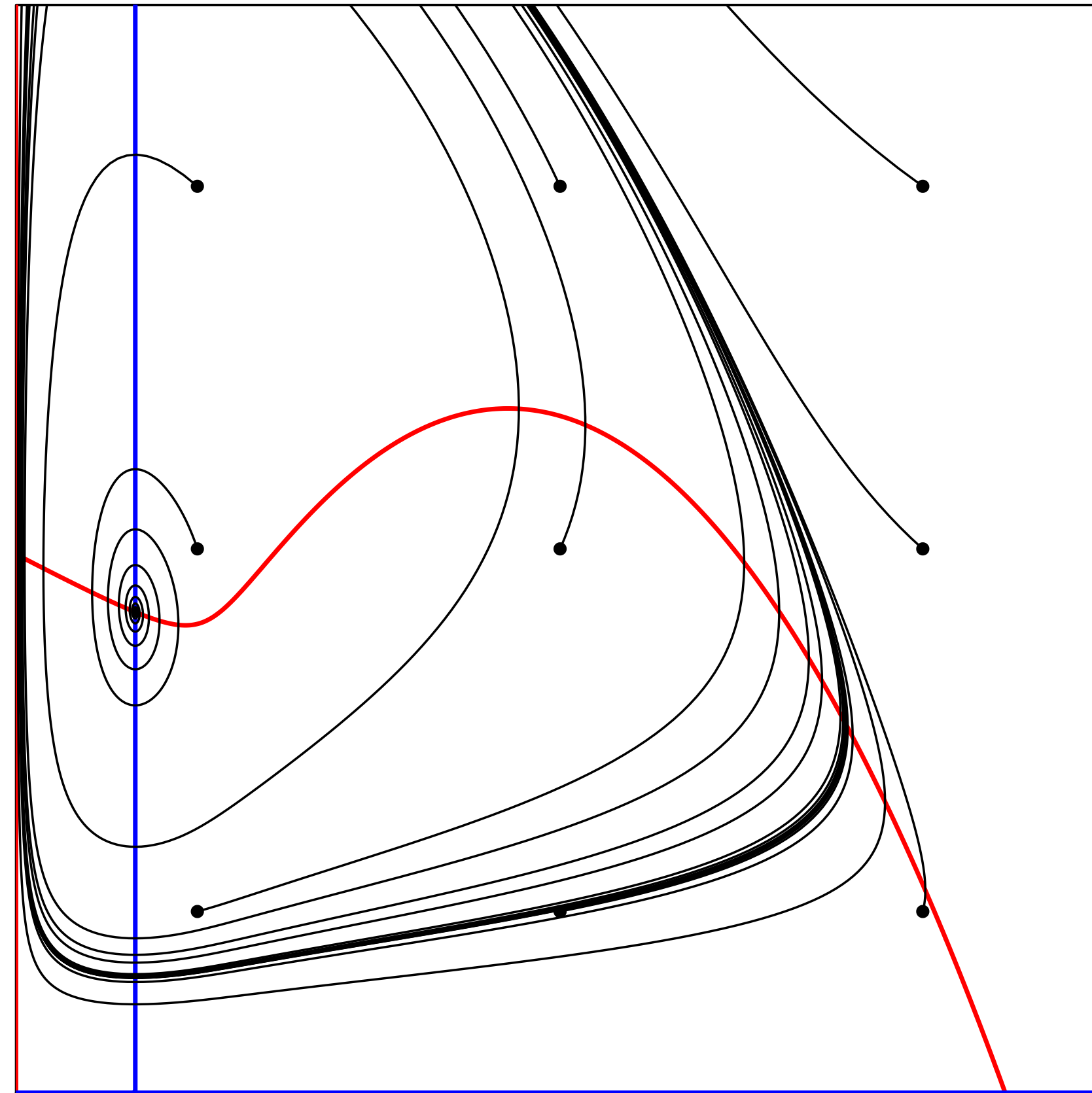# Biological Modeling of Populations



Rob J de Boer
Theoretical Biology & Bioinformatics

Utrecht University
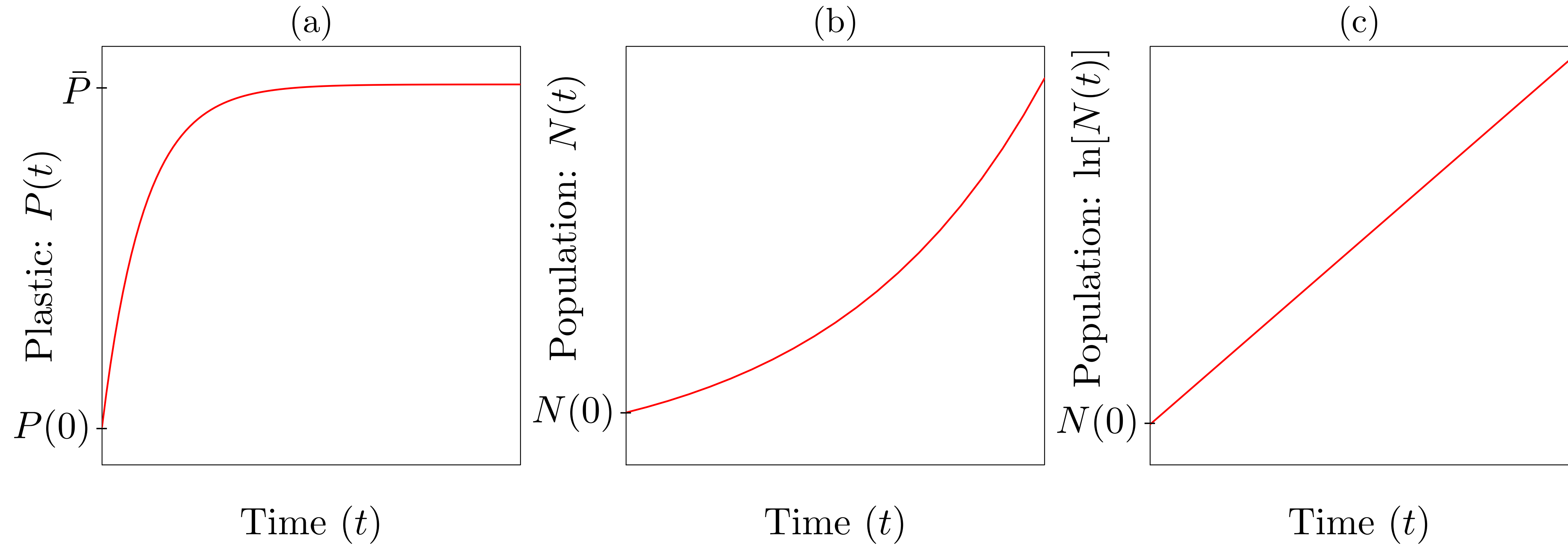
# Chapter 2: Introduction

Concepts: ODE and its solution, steady state
half life, doubling time, expected life span, fitness $R_0$

$$\frac{\mathrm{d}P}{\mathrm{d}t} = k - dP \qquad\qquad P(t) = \frac{k}{d}\left(1 - \mathrm{e}^{-dt}\right) + P(0)\mathrm{e}^{-dt}$$

$$\frac{\mathrm{d}P}{\mathrm{d}t} = k - dP = 0 \quad \text{to obtain} \quad \bar{P} = \frac{k}{d}$$

(a)

(b)

(c)



$$\frac{\mathrm{d}N}{\mathrm{d}t} = (b - d)N \quad \text{with solution} \quad N(t) = N(0)\mathrm{e}^{(b-d)t} \ ,$$