WORKSHOP 2·11

Problem

Imagine individuals of a group interacting in a large area (for example, bushbuck antelopes in a montane forest). Let P denote the probability that an individual is not in contact with another (a bushbuck in contact with another will alter its behaviour, sometimes by changing its "home area"). P is modelled by the equation

$$P = e^{-\pi\rho D^2},$$

where ρ is the density of individuals and D is the "spotting distance" of individuals in that group. Suppose the function $\rho'(t)$ is determined by field observations (in population ecology, it is often easier to measure this function than $\rho(t)$). Come up with an expression for the rate of change of the probability that an individual is in contact with at least one other individual at time t.