Qualitative Solutions and Phase Lines

Differential Equations

College of the Atlantic. Fall, 2014

1. Consider the following differential equation:

$$\frac{dN}{dt} = 0.5N \,, \tag{1}$$

for non-negative N.

(a) Sketch the right-hand side of the equation.
(b) Use this sketch to then sketch a few solutions of the differential equation.
(c) What is the long-term fate of all starting values for N?
(d) To what situation might this equation apply?

2. Consider the differential equation

$$\frac{dP}{dt} = f(P) \,, \tag{2}$$

where $f(P)$ is shown in the figure. We will only consider non-negative P.

(a) Sketch the solution for the initial value $P(0) = 50$.
(b) Sketch the solution for the initial value $P(0) = 200$.
(c) Sketch the solution for the initial value $P(0) = 400$.