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Optimization and Dynamics

Summer term 2007

Assignment sheet 4

(16) Discuss the bifurction at $a = 0$ for the following dynamical systems

(a) $f_a(x) = x + x^2 - a$

(b) $g_a(x) = x + x^2 - a^2$.

What are the fixed points for $a < 0$ and $a > 0$? Discuss their stability, and sketch the bifurcation diagram. Do you know this kind of bifurcation yet, or is it similar to some type of bifurcation you know already? Why (not)? Compare the two cases (a) and (b).

For which values of a do you expect another bifurcation?

(17) Discuss the bifurction at $a = 0$ for the following dynamical system

$$f_a(x) = x + (x^2 - a^2)(x^2 - 4a^2).$$

What are the fixed points for $a < 0$ and $a > 0$? Discuss their stability, and sketch the bifurcation diagram. Do you know this kind of bifurcation yet, or is it similar to some type of bifurcation you know already? Why (not)?

For which values of a do you expect another bifurcation?

Please hand in until 3.5.2007.