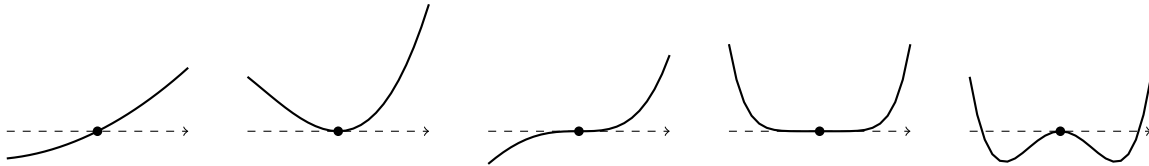


Worksheet 19

Objectives: (1) Understand existence/uniqueness/sensitivity results for optimization problems

Problem 1: Existence and Uniqueness of minimizers

(a) Are the following functions coercive? convex? strictly convex?



(b) What does the coercivity, convexity, and strict convexity of the functions mean for the minimizers?

(c) Suppose $\nabla f(x^*) = 0$ and $H_f(x^*)$ is negative definite. (i.e. $-H_f(x^*)$ is positive definite) What does f look like near x^* ?

Problem 2: Quadratic approximation and Newton

(a) Write down the $O(h^3)$ Taylor series approximation for a function $f : \mathbb{R}^n \rightarrow \mathbb{R}$

(b) Where does your Taylor approximation achieve its minimum?

(c) Consider $f(x) = 5x^2 + 3x + 1$. How many iterations does Newton's method use to converge to the minimum of f ?