Homework #10

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1. Suppose that $f : \mathbb{R}^n \to \mathbb{R}$ is concave. Prove that:

   (a) $f(y) - f(x) \leq Df(x)(y - x)$, for all $x, y \in \mathbb{R}^n$.

   Hint: Recall the result from Q3, HW#9

   (b) $(Df(y) - Df(x))(y - x) \leq 0$, for all $x, y \in \mathbb{R}^n$.

2. Sundaram, #6 p. 222.

3. Let $U \subset \mathbb{R}^n$ be open and convex, for each $i = 1, ..., k$ let $h_i : U \to \mathbb{R}$ be a quasiconcave funtion. Define

$$D = \{x \in U : h_i(x) \geq 0 \text{ for all } i = 1, ..., k\}.$$

   Show that D is convex.

4. Sundaram, #7, p. 222.

5. Sundaram, #11, p. 223.