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What is on today

1 Optimization Problems

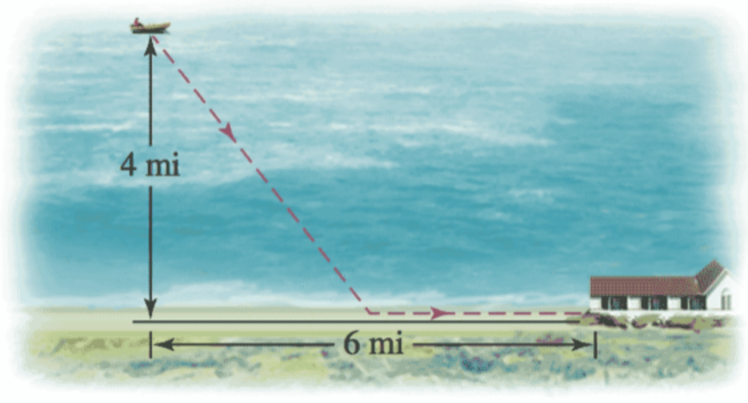
Briggs-Cochran-Gillett §4.4 pp. 270-280

Now that we know what derivatives tell us, we can use this knowledge in *optimization* problems. The goal of optimization is finding the most *efficient* way to carry out a task, where efficient could mean least expensive, most profitable, least time-consuming, etc., depending on the situation. We will explore this in a set of examples, though the same ideas can be used in many situations!

Example 1 (§4.4 Ex. 9)**.** *What two nonnegative real numbers with a sum of 23 have the largest possible product?*

Example 2 (§4.4 Ex. 17: Shipping crates). *A square-based, box-shaped shipping crate is designed to have a volume of* 16 ft^3*. The material used to make the base costs twice as much (per square foot) as the material in the sides, and the material to do the top costs half as much (per square foot) as the material in the sides. What are the dimensions of the crate that minimize the cost of materials?*

Example 3 (§4.4 Ex. 21: Walking and rowing)**.** *A boat on the ocean is* 4 *mi from the nearest point on a straight shoreline; that point is* 6 *mi from a restaurant on the shore. A woman plans to row the boat straight to some point on the shore and then walk to the restaurant.*



1. *If she walks at* 3 *mi/hr and rows at* 2 *mi/hr, at which point on the shore should she land to minimize the total travel time?*
2. *If she walks at* 3 *mi/hr, what is the minimum speed at which she must row so that the quickest way to the restaurant is to row directly (with no walking)?*

Example 4 (§4.4 Ex. 40: Circle on a triangle)**.** *What are the radius and area of the circle of maximum area that can be inscribed in an isosceles triangle whose two equal sides have length* 1*?*