

WORKSHEET 7

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Problem 1. Consider the function $f(x) = (x - 1)^{1/3} - \frac{x}{12}$.

(a) Find all critical points of $f(x)$.

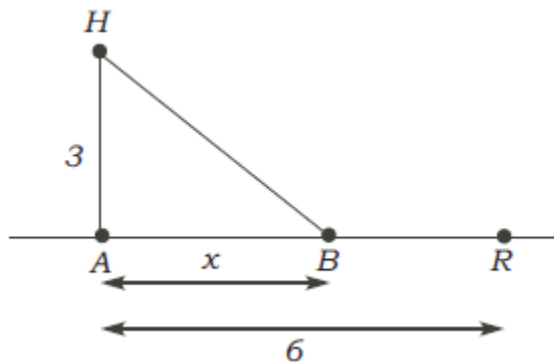
(b) Find the absolute maximum and absolute minimum of $f(x)$ for $0 \leq x \leq 28$.

Problem 2. Consider the function $g(x) = xe^{-2x^2}$.

(a) Find all critical points of $g(x)$.

(b) Find the absolute maximum and absolute minimum of $g(x)$ for $0 \leq x \leq 1$.

Problem 3. A house H is located in the woods, 3 miles from the nearest point, A , on a straight road. A restaurant, R , is located 6 miles down the road from A . Jack can ride his bike 10 miles per hour (mph) in the woods and 20 mph along the road. He decides to ride the bike through the woods to some intermediate point B , x miles from A , and then ride along the road to R . Since he is starving, he wants to minimize his time T .



- (a) Find the time T in terms of x .
- (b) What are the possible values of x for which you should minimize $T(x)$? If possible, write your answer in interval form. Is the interval open or closed?

(c) Find x that minimizes the time T .

Problem 4. Consider the function $f(x) = x \ln(x^2)$.

- (a) Find the derivative of $f(x)$.
- (b) Using your answer from part (a), verify that the function $f(x)$ satisfies the hypotheses of the Mean Value Theorem on the interval $[1, e]$. Explain clearly in words which conditions are satisfied.
- (c) Find all numbers c that satisfy the conclusion of the Mean Value Theorem for $f(x)$ on the interval $[1, e]$.