1a. Find all critical points of $f(x) = (x-1)^{1/3} - \dfrac{x}{12}$.

1b. Find the absolute maximum and absolute minimum of $f(x) = (x-1)^{1/3} - \dfrac{x}{12}$ for $0 \le x \le 28$.

2a. Find all critical points of $g(x) = xe^{-2x^2}$.

2b. Find the absolute maximum and absolute minimum of $g(x) = xe^{-2x^2}$ for $0 \le x \le 1$.

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 in the woods and 20 miles per hour 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.

3a. Find time T in terms of x.
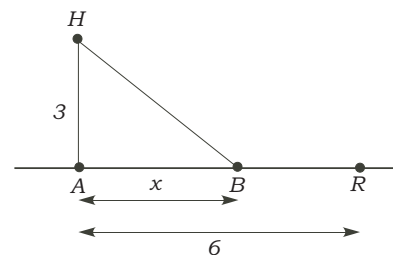
3b. What are the possible values of x on which you should minimize $T(x)$? Is this a closed and bounded interval?

3c. Find x that minimizes the time T.

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

4a. Find the derivative of $f(x)$.

4b. Using Q4(a), verify that the function $f(x) = x \ln(x^2)$ satisfies the hypotheses of the Mean Value Theorem on $[1, e]$. Explain clearly in words.

4c. Find all numbers c that satisfies the conclusion of the Mean Value Theorem for $f(x) = x \ln(x^2)$ on $[1, e]$.