AP Calculus AB

Topic: Extreme Values of Functions

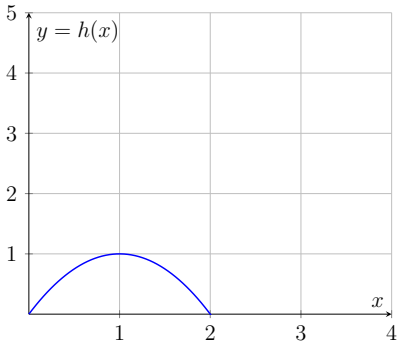
Instructions

Solve the following problems. Show all work and include proper mathematical justifications.

Practice Problems

1. Find the absolute maximum and minimum values of $f(x) = x^2 - 4x + 5$ on the interval $[0, 3]$.
2. Determine the critical points of $f(x) = x^3 - 6x^2 + 9x + 1$ and classify them as local maxima, minima, or saddle points.
3. Find the extreme values of $f(x) = e^x - x^2$ on the interval $[0, 2]$.
4. Use the first derivative test to find the local extrema of $f(x) = \ln(x^2 + 1)$.
5. Sketch the graph of $f(x) = \sin(x)$ on $[0, 2\pi]$ and label all extreme values.
6. Identify each x-value at which any absolute extreme value occurs. Explain how your answer is consistent with the Extreme Value Theorem.

(a)



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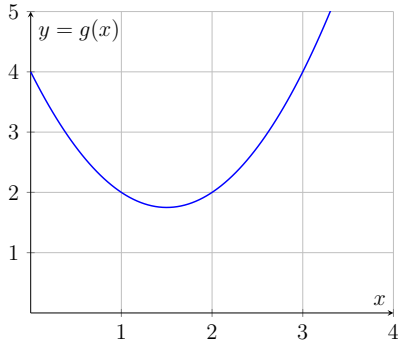

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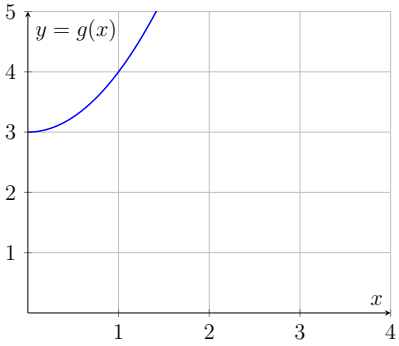
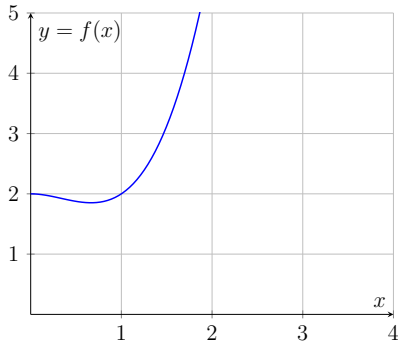


(c)



Multiple Choice Questions

1. What is the derivative of $y = e^x$?
   a. e^x
   b. $x \cdot e^x$
   c. $\ln(x)$
   d. 1
2. Which of the following is the derivative of $y = \ln(x)$?
   a. $1/x$
   b. $\ln(x)$
   c. e^x
   d. x
3. The derivative of $y = 2^x$ is:
   a. $2^x \cdot \ln(2)$
   b. e^x
   c. $\ln(2)$
   d. $x \cdot 2^x$