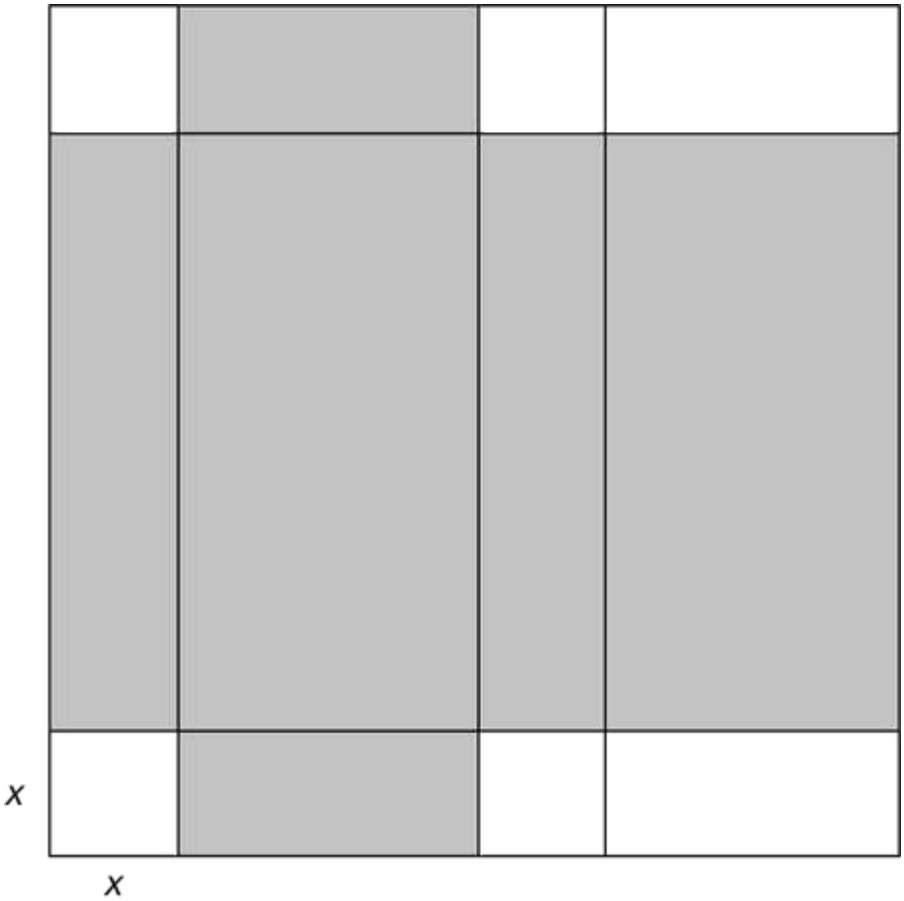
Quiz 5.11

Name

1.



The figure above represents a square sheet of cardboard with side length 40 inches. The sheet is cut and pieces are discarded. When the cardboard is folded, it becomes a rectangular box with a lid. The pattern for the rectangular box with a lid is shaded in the figure. Four squares with side length x and two rectangular regions are discarded from the cardboard. Which of the following statements is true? (The volume V of a rectangular box is given by $V = lwh$.)

(A) When $x = 20$ inches, the box has a minimum possible volume.

(B) When $x = 20$ inches, the box has a maximum possible volume.

(C) When $x = \frac{20}{3}$ inches, the box has a minimum possible volume.

(D) When $x = \frac{20}{3}$ inches, the box has a maximum possible volume.

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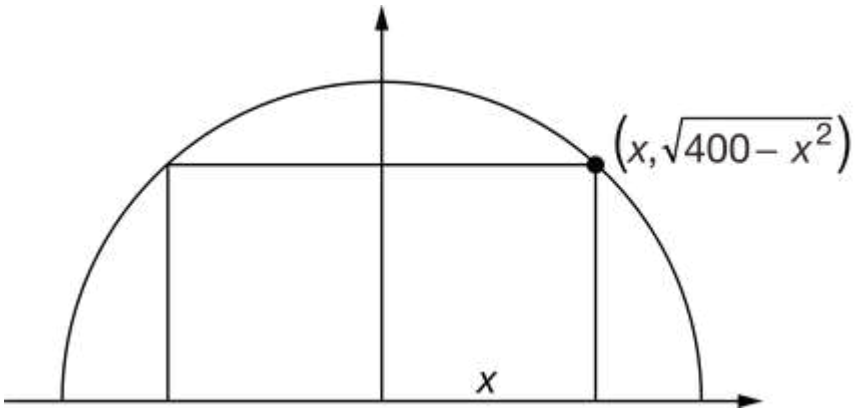
2.



The figure above shows a rectangle inscribed in a semicircle with a radius of 20. The area of such a rectangle is given by $A(x) = 2x\sqrt{400 - x^2}$, where the width of the rectangle is $2x$. It can be shown that $A'(x) = \frac{-2x^2}{\sqrt{400-x^2}} + 2\sqrt{400 - x^2}$ and A has critical values of -20, $-10\sqrt{2}$, $10\sqrt{2}$, and 20. It can also be shown that $A'(x)$ changes from positive to negative at $x = 10\sqrt{2}$. Which of the following statements is true?

(A) The inscribed rectangle with maximum area has dimensions $10\sqrt{2}$ by $10\sqrt{2}$.

(B) The inscribed rectangle with minimum area has dimensions $10\sqrt{2}$ by $10\sqrt{2}$.

(C) The inscribed rectangle with maximum area has dimensions $20\sqrt{2}$ by $10\sqrt{2}$.

(D) The inscribed rectangle with minimum area has dimensions $20\sqrt{2}$ by $10\sqrt{2}$.

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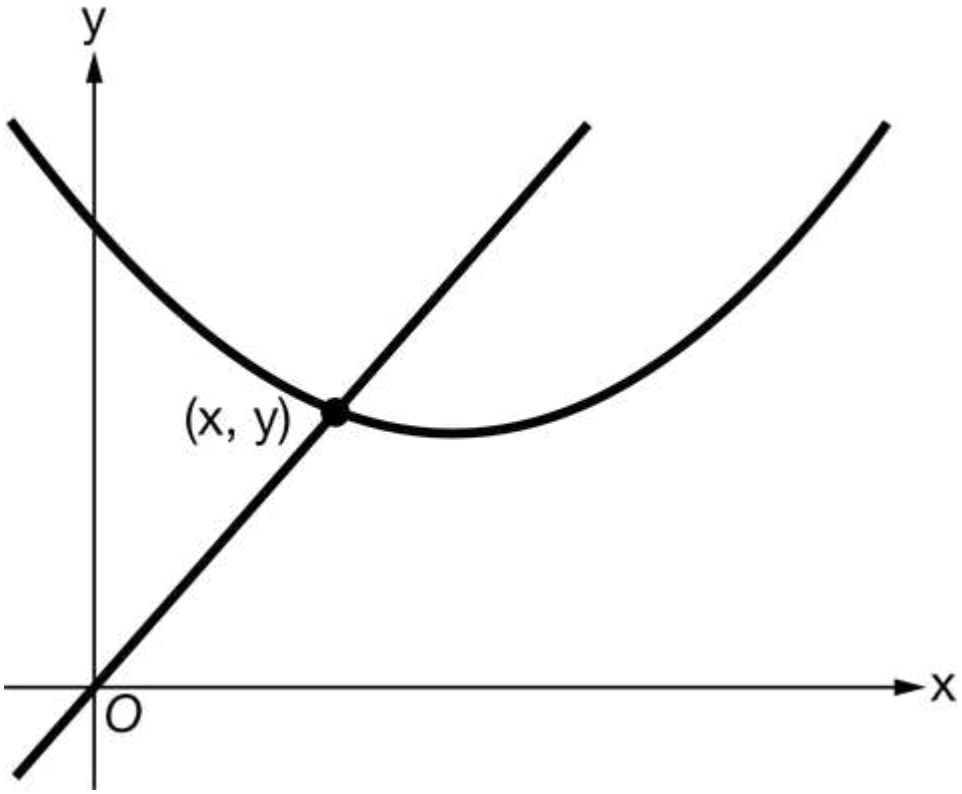
3.



Consider all lines in the xy-plane that pass through both the origin and a point (x, y) on the graph of $y = x^2 - 4x + 9$ for $1 \leq x \leq 4$. The figure above shows one such line and the graph of $y = x^2 - 4x + 9$. Which of the following statements is true?

(A) The line with minimum slope passes through the graph of $y = x^2 - 4x + 9$ at $x = 1$.

(B) The line with minimum slope passes through the graph of $y = x^2 - 4x + 9$ at $x = 2$.

(C) The line with minimum slope passes through the graph of $y = x^2 - 4x + 9$ at $x = 3$.

(D) The line with minimum slope passes through the graph of $y = x^2 - 4x + 9$ at $x = 4$.