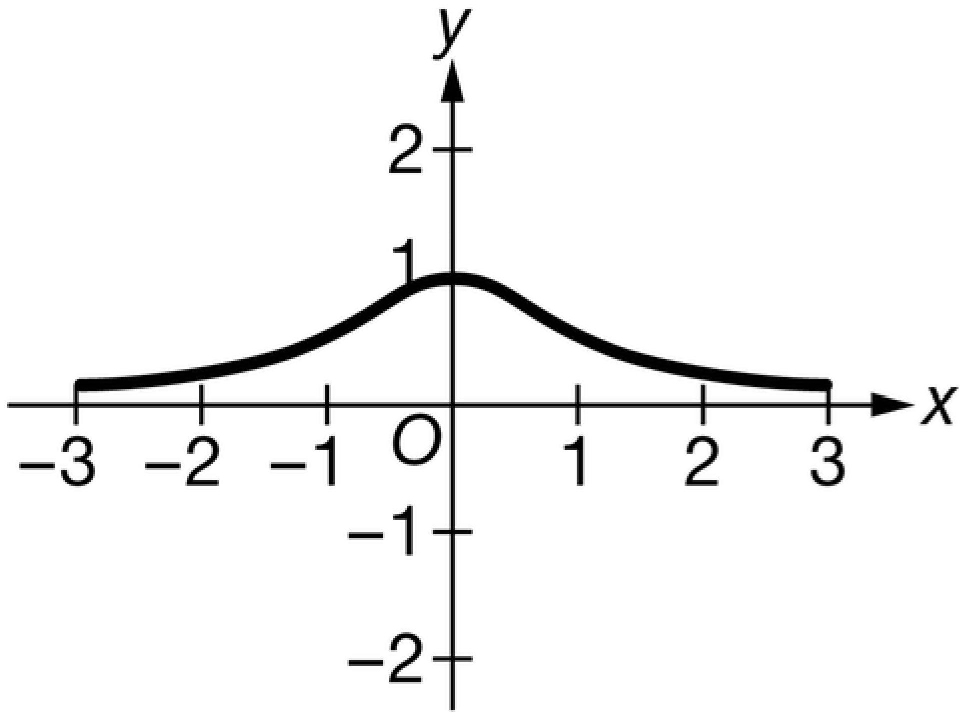
Unit 5 Progress Check: MCQ Part C

1.



Graph of f

The graph of $y = f(x)$ is shown above. Which of the following could be the graph of $y = f''(x)$?

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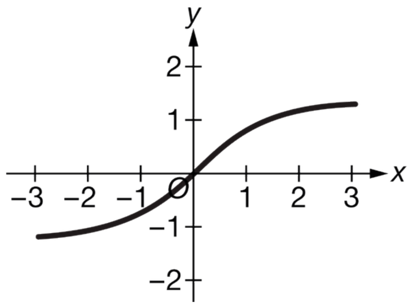
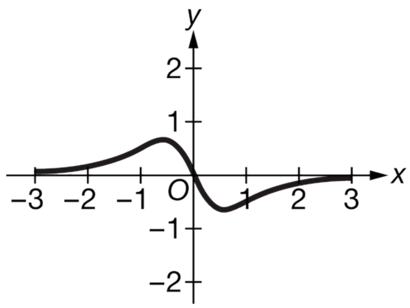
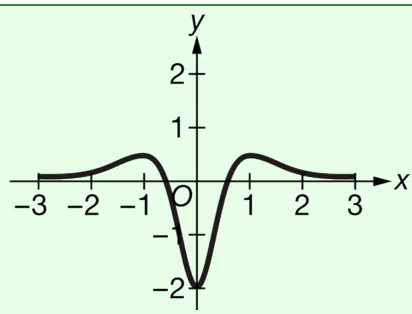
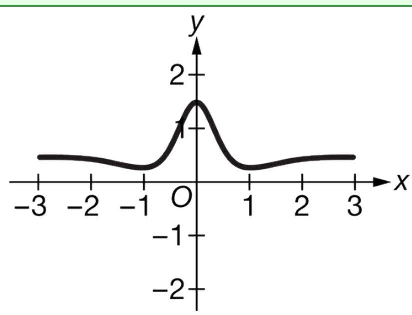
(A) 

(B) 

(C) 

(D) 

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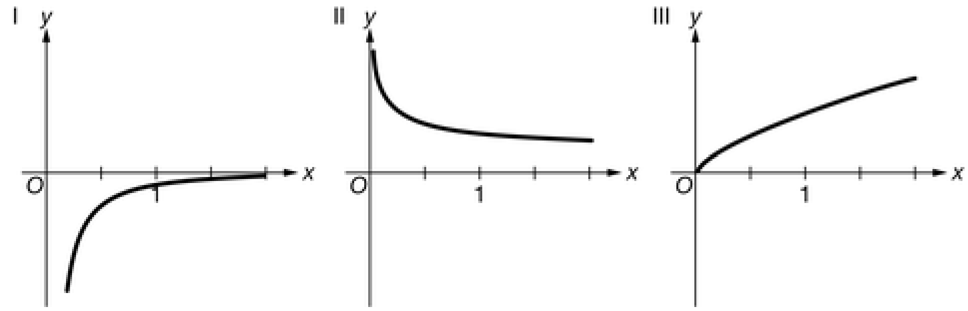
2.



Three graphs labeled I, II, and III are shown above. One is the graph of f, one is the graph of f', and one is the graph of f''. Which of the following correctly identifies each of the three graphs?

(A)

f	f'	f''
I	II	III

(B)

f	f'	f''
II	III	I

(C)

f	f'	f''
III	I	II

(D)

f	f'	f''
III	II	I

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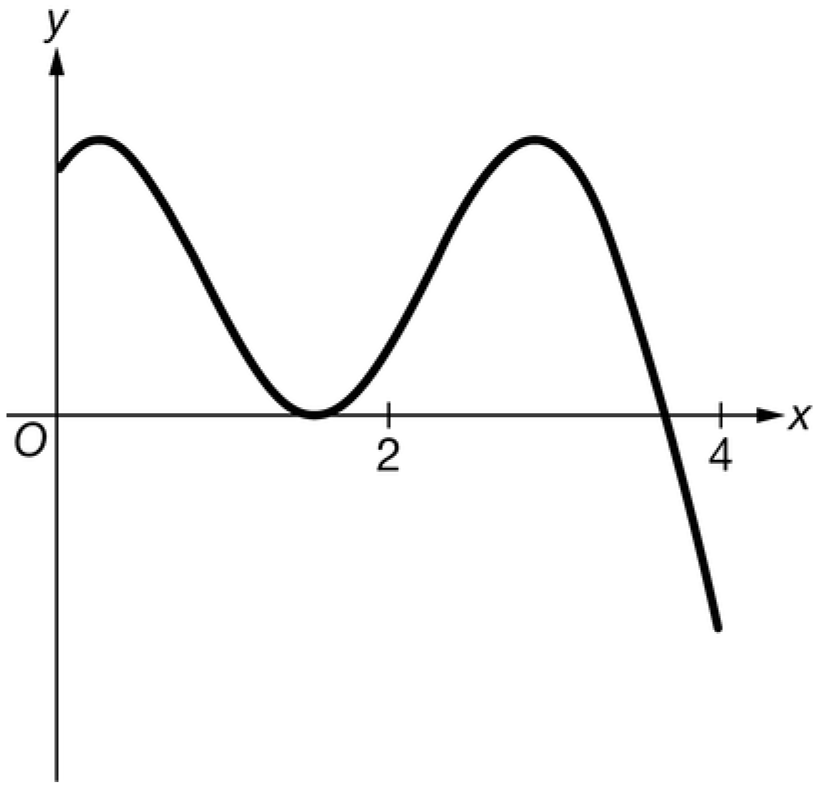
3.



Graph of f

The figure above shows the graph of f on the interval $[0, 4]$. Which of the following could be the graph of f', the derivative of f, on the interval $[0, 4]$?

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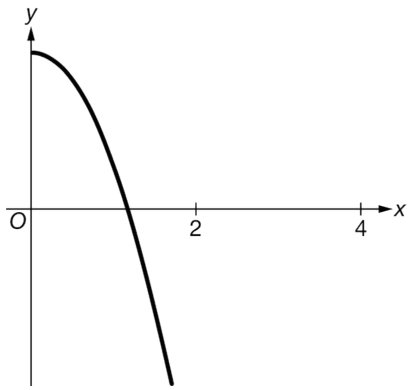
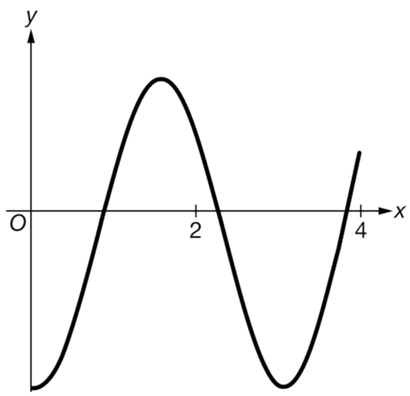
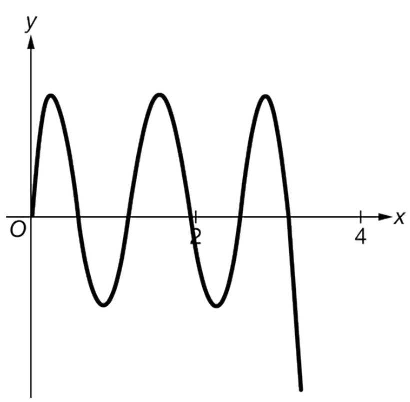
(A)



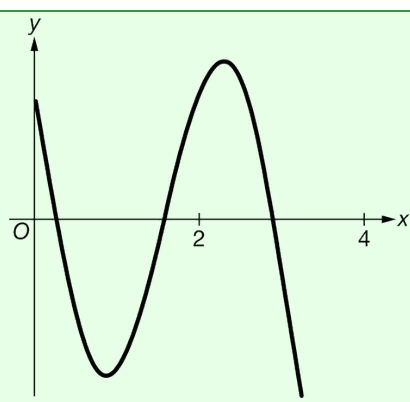
(B)



(C)



(D)



4. The acceleration, in centimeters per second per second, of a projectile is modeled by $A(t) = 2t^3 - 15t^2 + 36t$, where t is measured in seconds. What is the projectile's maximum acceleration on the time interval $0 \le t \le 4$?

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(A) The maximum acceleration of the projectile is 4 centimeters per second per second and occurs at $t = 32$ seconds.

(B) The maximum acceleration of the projectile is 27 centimeters per second per second and occurs at $t = 3$ seconds.

(C) The maximum acceleration of the projectile is 28 centimeters per second per second and occurs at $t = 2$ seconds.

(D) The maximum acceleration of the projectile is 32 centimeters per second per second and occurs at $t = 4$ seconds. ✓

5. The total cost, in dollars, to order x units of a certain product is modeled by $C(x) = 7x^2 + 252$. According to the model, for what size order is the cost per unit a minimum?

(A) An order of 1 unit has a minimum cost per unit.

(B) An order of 6 units has a minimum cost per unit. ✓

(C) An order of 84 units has a minimum cost per unit.

(D) An order of 252 units has a minimum cost per unit.

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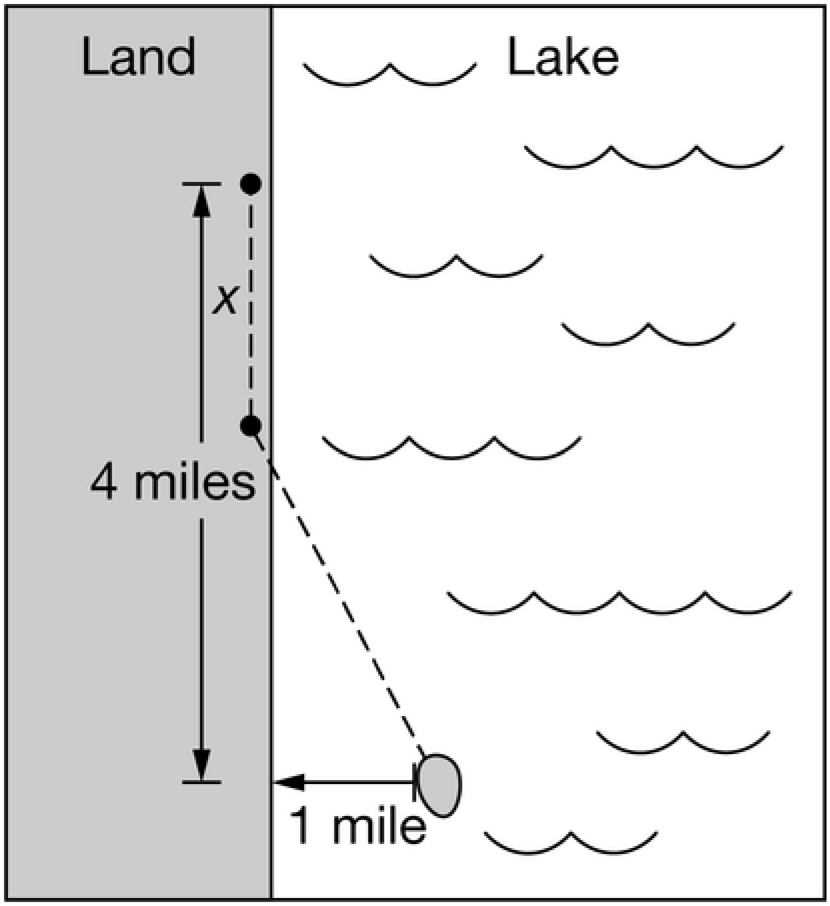
6.



An athlete is planning for the "Land and Lake Race," the path of which is shown in the figure above. The contestants will start at the dot, run up to 4 miles along the beach, enter the water at any time, and swim to the island. The athlete estimates that they can run along the beach at a constant rate of 8 miles per hour and swim at a constant rate of 2 miles per hour. Let T be a function that represents the time to complete the race, where x is the distance in miles that the athlete runs and $T(x)$ is measured in hours. Which of the following methods best explains how to determine the minimum time, in hours, the athlete should run along the beach and then swim to the island?

(A) Let $T(x) = 8x + 2\sqrt{1^2 + (4-x)^2}$. Solve $T'(x) = 0$ and find the values of x where $T'(x)$ changes sign from negative to positive. Evaluate T for those values of x to determine the minimum time.

(B) Let $T(x) = \frac{x}{8} + \frac{\sqrt{1^2+(4-x)^2}}{2}$. Solve $T'(x) = 0$ and find the values of x where $T'(x)$ changes sign from negative to positive. Evaluate T for those values of x to determine the minimum time. ✓

(C) Let $T(x) = \frac{x}{8} + \frac{\sqrt{1^2+x^2}}{2}$. Solve $T'(x) = 0$ and find the values of x where $T'(x)$ changes sign from negative to positive. Evaluate T for those values of x to determine the minimum time.

(D) Let $T(x) = \frac{x}{8} + \frac{\sqrt{(4-x)^2}}{2}$. Solve $T'(x) = 0$ and find the values of x where $T'(x)$ changes sign from negative to positive. Evaluate T for those values of x to determine the minimum time.

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7. Consider the curve defined by $y^2 = x^3 - 3x + 3$ for $x > 0$. At what value of x does the curve have a horizontal tangent?

(A) $\frac{\sqrt{3}}{3}$

(B) 1 ✓

(C) $\sqrt{3}$

(D) There is no such value of x.

8. A curve in the xy-plane is defined by the equation $\frac{x^3}{3} + \frac{y^2}{2} - 3x + 2y = -\frac{1}{6}$. Which of the following statements are true?

I. At points where $x = \sqrt{3}$, the lines tangent to the curve are horizontal.
II. At points where $y = -2$, the lines tangent to the curve are vertical.
III. The line tangent to the curve at the point $(1, 1)$ has slope $\frac{2}{3}$.

(A) I and II only

(B) II and III only

(C) I and III only

(D) I, II, and III ✓

9. In the xy-plane, how many points on the curve $y^2 + x^2 = 3 - xy$ have horizontal or vertical tangent lines?

(A) No points have vertical tangent lines, and two points have horizontal tangent lines.

(B) One point has a vertical tangent line, and one point has a horizontal tangent line.

(C) Two points have vertical tangent lines, and two points have horizontal tangent lines. ✓

(D) No points have vertical tangent lines, and no points have horizontal tangent lines.

10. Let C be the curve defined by $x^2 - y^2 = 1$. Consider all points (x, y) on curve C where $x > 1$ and $y > 0$. Which of the following statements provides a justification for the concavity of the curve?

(A) The curve is concave down because $y'' = -\frac{x}{y^2} < 0$.

(B) The curve is concave up because $y'' = \frac{1}{y^2} > 0$.

(C) The curve is concave down because $y'' = -\frac{1}{y^3} < 0$. ✓

(D) The curve is concave up because $y'' = \frac{1}{y^3} > 0$.

11. The point $(1, 1)$ is on the curve defined by $x^2 + y^3 = 2$. Which of the following statements is true about the curve at the point $(1, 1)$?

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(A) $\frac{dy}{dx} > 0$ and $\frac{d^2y}{dx^2} > 0$

(B) $\frac{dy}{dx} > 0$ and $\frac{d^2y}{dx^2} < 0$

(C) $\frac{dy}{dx} < 0$ and $\frac{d^2y}{dx^2} > 0$

(D) $\frac{dy}{dx} < 0$ and $\frac{d^2y}{dx^2} < 0$

12. In the xy-plane, the point $(0, 2)$ is on the curve C. If $\frac{dy}{dx} = -\frac{4x}{3y}$ for the curve, which of the following statements is true?

(A) At the point $(0, 2)$, the curve C has a relative minimum because $\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} > 0$.

(B) At the point $(0, 2)$, the curve C has a relative minimum because $\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} < 0$.

(C) At the point $(0, 2)$, the curve C has a relative maximum because $\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} > 0$.

(D) At the point $(0, 2)$, the curve C has a relative maximum because $\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} < 0$.