

AB Calculus Practice 2.3

Points of inflection

1. Where $f''(x)$ is positive, $f(x)$ is _____ and $f'(x)$ is _____.
2. Where $f''(x)$ is negative, $f(x)$ is _____ and $f'(x)$ is _____.
3. At a point where $f''(x)$ is equal to zero or undefined, there's often (but not always) a _____
_____.
4. A point of inflection happens when $f(x)$ changes _____, which means $f''(x)$ changes _____.
5. Points of inflection on f happen at the _____ of the graph of f' , even if f' isn't _____ at those points.
6. In the case of both f' and f'' , you won't see an extremum or point of inflection (respectively) if the multiplicity of the zero is _____.

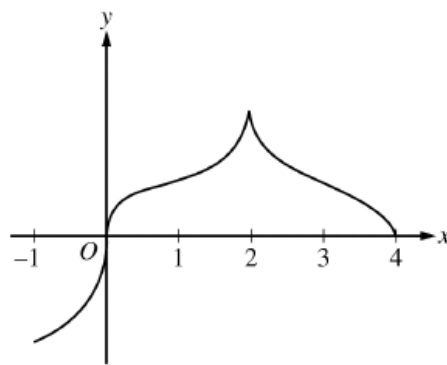
bold numbers - calculator permitted

7. The function f has first derivative given by $f'(x) = \frac{\sqrt{x}}{1 + 4x + x^3}$. What is the x -coordinate of the inflection point of the graph of f ? *Round to three decimal places*

8. Let f be the function with derivative defined by $f'(x) = x^3 - 12x$. At which value(s) of x does the graph of f have a point of inflection?

9. What is the x -coordinate of the point of inflection on the graph of $y = \frac{1}{3}x^3 - 7x^2 + 12$?

10. The second derivative of a function f is given by $f''(x) = \cos(3x) - \sin(x^2)$. How many points of inflection does the graph of f have on the interval $0 < x < 4$?



Graph of f'

11. The graph of f' , the derivative of f , is shown above. The line tangent to the graph of f' at $x = 0$ is vertical, and f' is not differentiable at $x = 2$. Which of the following statements is false?

- (A) $f'(2)$ exists.
- (B) f is increasing on the interval $(2, 4)$.
- (C) The graph of f has a point of inflection at $x = 2$.
- (D) The graph of f has a point of inflection at $x = 0$.
- (E) f has a local minimum at $x = 0$.

x	-2	0	3	5	6
$f'(x)$	3	1	4	7	5

12. Let f be a polynomial function with values of $f'(x)$ at selected values of x given in the table above.

Which of the following must be false for $-2 < x < 6$?

- (A) The graph of f is concave up
- (B) The graph of f has at least two points of inflection
- (C) f is increasing
- (D) f has no critical points
- (E) f has at least two relative extrema

13. Let g be the function defined by $g(x) = x^7 + 4x^6$. How many relative extrema does g have?

14. If $f'(x) = (x + 1)(x + 2)^3(x + 3)^4$, then f has which of the following relative extrema?

Circle all that apply

- I. A relative maximum at $x = -1$
- II. A relative maximum at $x = -2$
- III. A relative maximum at $x = -3$

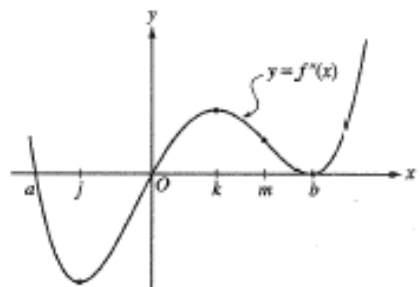
15. The function f has a first derivative given by $f'(x) = x(x + 7)^2(x + 4)$. At what value(s) of x does f have a relative minimum?

16. If $f''(x) = x(x + 4)(x - 3)^2$, then the graph of f has inflection points when $x =$

17. For what value(s) of x does the graph of $y = 6x^5 + 5x^4$ have a point of inflection?

18. Let f be the function given by $f(x) = x^3 - 12x^2$. The graph of f is concave down when

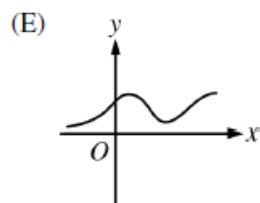
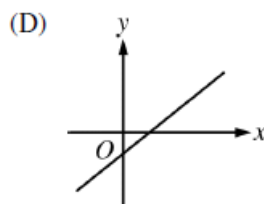
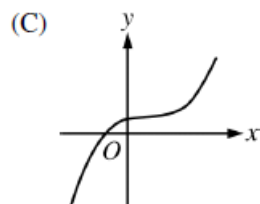
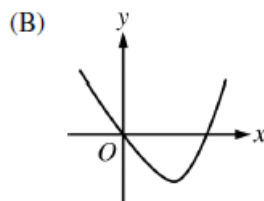
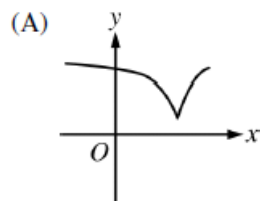
19. If $f''(x) = x(x + 3)^2$, then the graph of f is concave down for

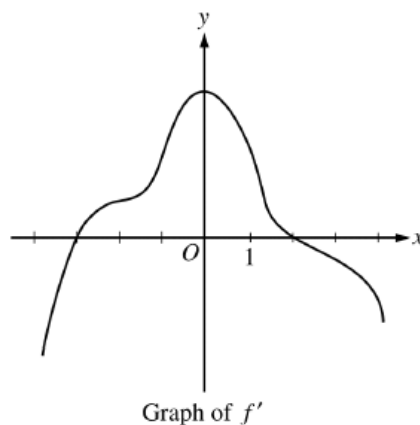


20. The second derivative of the function f is given by $f'' = x(x - a)(x - b)^2$. The graph of f'' is shown above. For what values of x does the graph of f have a point of inflection?

- (A) 0, a , and b
- (B) b , j , and k
- (C) 0 and a only
- (D) 0 and m only
- (E) b and j only

21. The function f is differentiable and increasing for all real numbers x , and the graph of f has exactly one point of inflection. Of the following, which could be the graph of f' , the derivative of f ?

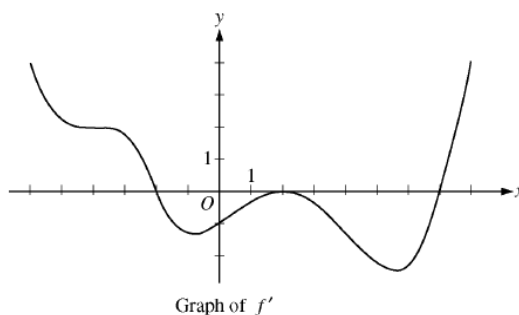




22. The graph of f' , the derivative of the function f , is shown above. Which of the following statements must be true?

- I. f has a relative minimum at $x = -3$
- II. The graph of f has a point of inflection at $x = -2$
- III. The graph of f is concave down for $0 < x < 4$

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I and III only



23. The figure above shows the graph of f' , the derivative of the function f , for $-6 < x < 8$. Of the following, which best describes the graph of f on the same interval?

- (A) 1 relative minimum, 1 relative maximum, and 3 points of inflection
- (B) 1 relative minimum, 1 relative maximum, and 4 points of inflection
- (C) 2 relative minima, 1 relative maximum, and 2 points of inflection
- (D) 2 relative minima, 1 relative maximum, and 4 points of inflection
- (E) 2 relative minima, 2 relative maxima, and 3 points of inflection