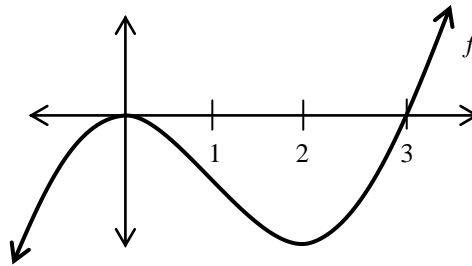


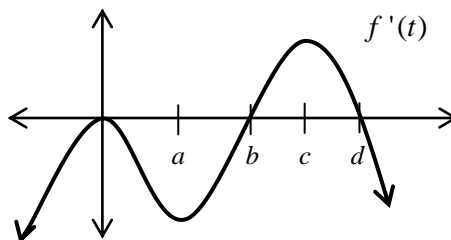
Analyzing Graphs of a Function and its First Derivative: Critical Points

Use the figure on the right to answer #1 to #10.



1. On what interval is $f(x)$ positive?
 - (A) $(0, +\infty)$
 - (B) $[1, +\infty)$
 - (C) $[2, +\infty)$
 - (D) $(3, +\infty)$
 - (E) $(0, 3)$
2. On what interval is $f(x)$ negative?
 - (A) $(-\infty, 0)$
 - (B) $(0, 3)$
 - (C) $(-\infty, 3)$
 - (D) $(-\infty, 0)$ and $(0, 3)$
 - (E) $(3, +\infty)$
3. $f'(x) = 0$ when $x =$
 - (A) 2
 - (B) 0 and 2
 - (C) 0
 - (D) 0 and 3
 - (E) 3
4. The critical value(s) of $f(x)$ is (are) $x =$
 - (A) 2
 - (B) 0 and 2
 - (C) 0
 - (D) 0 and 3
 - (E) 3
5. For what value(s) is the slope of the tangent 0?
 - (A) 2
 - (B) 0 and 2
 - (C) 0
 - (D) 0 and 3
 - (E) 3
6. For what value(s) is $f(x)$ a maximum or minimum?
 - (A) 2
 - (B) 0 and 2
 - (C) 0
 - (D) 0 and 3
 - (E) 3
7. On what interval(s) is $f'(x)$ positive?
 - (A) $(-\infty, 0)$ and $(2, +\infty)$
 - (B) $(-\infty, 0)$
 - (C) $(0, 2)$
 - (D) $(2, +\infty)$
 - (E) $(-\infty, 2)$
8. On what interval(s) is $f'(x)$ negative?
 - (A) $(-\infty, 0)$ and $(2, +\infty)$
 - (B) $(-\infty, 0)$
 - (C) $(0, 2)$
 - (D) $(2, +\infty)$
 - (E) $(-\infty, 2)$
9. On what interval(s) is the slope of the tangent line positive?
 - (A) $(-\infty, 0)$ and $(2, +\infty)$
 - (B) $(-\infty, 0)$
 - (C) $(0, 2)$
 - (D) $(2, +\infty)$
 - (E) $(-\infty, 2)$
10. On what interval(s) is the slope of the tangent line negative?
 - (A) $(-\infty, 0)$ and $(2, +\infty)$
 - (B) $(-\infty, 0)$
 - (C) $(0, 2)$
 - (D) $(2, +\infty)$
 - (E) $(-\infty, 2)$

Use the figure on the right to answer #11 to #18.
 Notice that **THE DERIVATIVE IS SHOWN**.



11. When is $f'(t) = 0$?

- (A) $0, a, c$
- (B) a, c
- (C) $0, b, d$
- (D) b, d
- (E) 0

12. What are the critical values of $f(t)$?

- (A) $0, a, c$
- (B) a, c
- (C) $0, b, d$
- (D) b, d
- (E) 0

13. When is $f'(t)$ positive?

- (A) $(-\infty, 0)$ and (a, c)
- (B) $(0, a)$ and $(c, +\infty)$
- (C) $(-\infty, 0)$, $(0, b)$, and $(d, +\infty)$
- (D) $(-\infty, b)$, and $(d, +\infty)$
- (E) (b, d)

14. When is $f'(t)$ negative?

- (A) $(-\infty, 0)$ and (a, c)
- (B) $(0, a)$ and $(c, +\infty)$
- (C) $(-\infty, 0)$, $(0, b)$, and $(d, +\infty)$
- (D) $(-\infty, b)$, and $(d, +\infty)$
- (E) (b, d)

15. When is $f(t)$ increasing?

- (A) $(-\infty, 0]$ and $[a, c]$
- (B) $[0, a]$ and $[c, +\infty)$
- (C) $(-\infty, 0)$, $(0, b]$, and $[d, +\infty)$
- (D) $(-\infty, b]$, and $[d, +\infty)$
- (E) $[b, d]$

16. When is $f(t)$ decreasing?

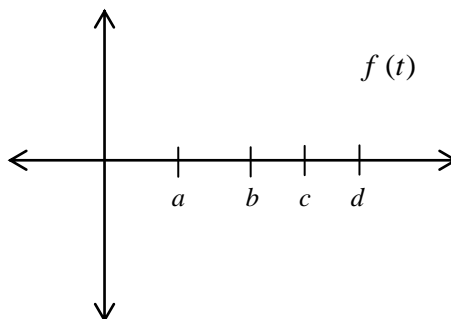
- (A) $(-\infty, 0]$ and $[a, c]$
- (B) $[0, a]$ and $[c, +\infty)$
- (C) $(-\infty, 0)$, $(0, b]$, and $[d, +\infty)$
- (D) $(-\infty, b]$, and $[d, +\infty)$
- (E) $[b, d]$

17. For each value of t below, classify $f(t)$ as a relative maximum, minimum, or neither.

0 _____ b _____ d _____
 a _____ c _____

18. Sketch a graph of $f(t)$.

Suppose $f(0) = 0$.



For #19 to #21, use the short-cut for derivatives to find the critical points. (Hint: Set $f'(x) = 0$, then solve for x .)

19. $f(x) = 3x^2 - 18x$

20. $f(x) = 2x^3 - 3.5x^2 - 24x + 1$

21. $f(x) = ax^2 + bx + c$ (JFF – What does the critical point represent?)

ANSWERS:

- | | | | | |
|------|-------|-------|------------------------|---------------|
| 1) D | 6) B | 11) C | 16) D | 21) $-b/(2a)$ |
| 2) D | 7) A | 12) C | 17) b -min, d -max | |
| 3) B | 8) C | 13) E | 18) graph | |
| 4) B | 9) A | 14) C | 19) 3 | |
| 5) B | 10) C | 15) E | 20) $8/3$ or $-3/2$ | |