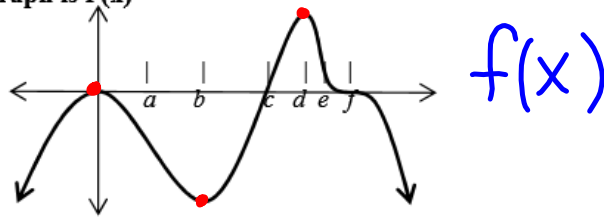


Using  $f'(x)$  and  $f''(x)$  WKST

Name: \_\_\_\_\_

No calculator is needed for these problems.  
A calculator may only be used to verify your solutions.

Use the figure on the right to answer #1 to #8. The graph is  $f(x)$



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

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

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

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

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

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

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

0 max      a N      b min      c N  
 d abs max      e N      f N

5. What are the possible points of inflection of  $f(t)$ ?

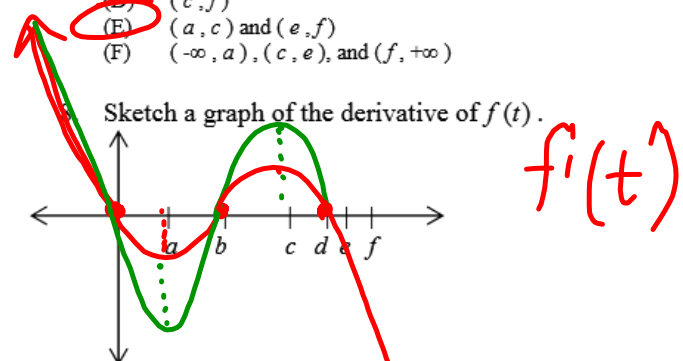
- (A)  $0, a, c$
- (B)  $a, c, e$
- (C)  $0, b, d$
- (D)  $b, d$
- (E)  $0$
- (F)  $0, b, d, f$

6. When is  $f(t)$  concaving up?

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

7. When is  $f(t)$  concaving down?

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



Sketch a graph of the derivative of  $f(t)$ .

9. On what interval is  $f(x) = x^3 + x$  concave up? THINK: When is the second derivative positive?

- (A)  $(-\infty, +\infty)$
- (B)  $(0, +\infty)$
- (C)  $(-\infty, 0)$
- (D)  $(0, 1)$
- (E)  $(-1, 0)$

$$f''(x) = 6x$$

10. The absolute maximum of  $f(x) = \frac{x}{x^2 + 1}$  is THINK: What are the critical values and what is the actual point of the max? (The y-value of the max.)

- (A) 0
- (B) .25
- (C) .5
- (D) .75
- (E) 1

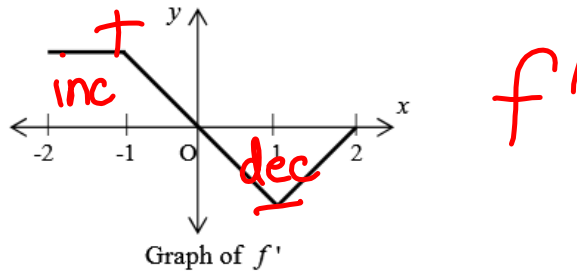
$$f'(x) = \frac{-x^2 + 1}{(x^2 + 1)^2}$$

$$x = \pm 1$$

$$(1, \frac{1}{2})$$

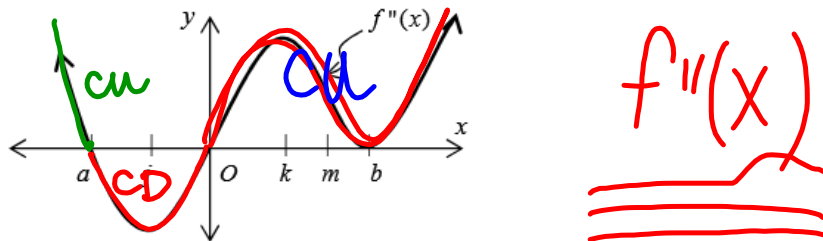
11. On what interval(s) is the graph of  $f(x) = \frac{x}{x^2 + 1}$  concave down?

- (A)  $(0, \sqrt{3})$
- (B)  $(-\sqrt{3}, 0)$
- (C)  $(-\sqrt{3}, 0) \cup (0, +\infty)$
- (D)  $(-\infty, -\sqrt{3}) \cup (0, \sqrt{3})$**
- (E)  $(\sqrt{3}, +\infty)$



12. The graph of  $f'$ , the derivative of the function  $f$ , is shown above. Which of the following statements is true about  $f$ ?

- ~~(A)  $f$  is decreasing for  $-1 \leq x \leq 1$~~
- (B)  $f$  is increasing for  $-2 \leq x \leq 0$**
- (C)  $f$  is increasing for  $-1 \leq x \leq 2$
- (D)  $f$  has a local minimum at  $x = 0$
- (E)  $f$  is not differentiable at  $x = -1$  and  $x = 1$



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

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

14. Over which interval(s) are the signs of both  $f'$  and  $f''$  the same for  $f(x) = 3x^4 - 4x^3 + 6$ ?

- (A)  $(0, \frac{2}{3})$
- (B)  $(-\infty, 0)$
- (C)  $(-\infty, 0) \cup (\frac{2}{3}, +\infty)$
- (D)  $(0, \frac{2}{3}) \cup (1, +\infty)$**
- (E)  $(\frac{2}{3}, +\infty)$