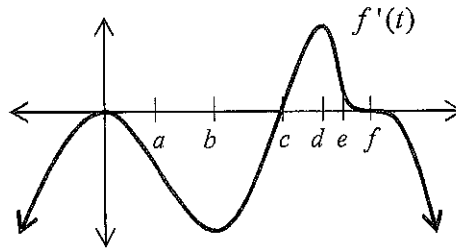


Name: _____

No calculator is allowed for these problems.

Use the figure on the right to answer #1 to #8.



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 _____ a _____ b _____ c _____
 d _____ e _____ f _____

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

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

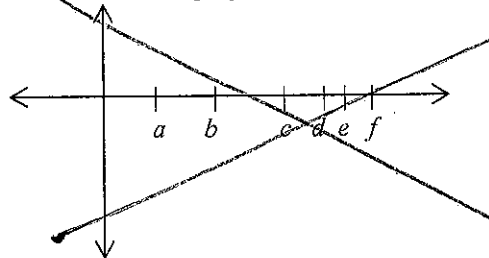
6. When is $f(t)$ concaving up?

- (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 $(f, +\infty)$

8. Sketch a graph of $f(t)$. Suppose $f(0) = 0$.



9. On what interval is $f(x) = x^3 + x$ concave up?

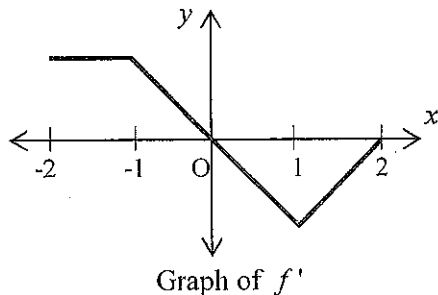
- (A) $(-\infty, +\infty)$
- (B) $(0, +\infty)$
- (C) $(-\infty, 0)$
- (D) $(0, 1)$
- (E) $(-1, 0)$

10. The absolute maximum of $f(x) = \frac{x}{x^2 + 1}$ is

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

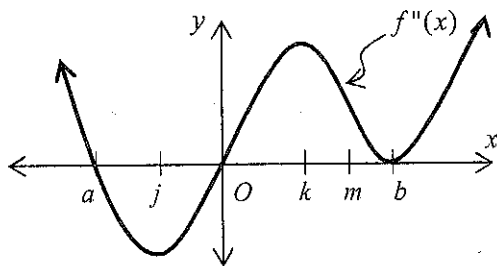
11. On what interval(s) is the graph of $f(x) = \frac{x}{x^2 + 1}$ concave down?

- (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) $(\frac{2}{3}, +\infty)$