Name_____ Date_____ Period_____

TEST: 3.1-3.4, NO CALCULATOR

Part I: Multiple Choice: Put the letter in the letter place. Be sure it's write, wright, rite, . . . correct.

_____ 1. The function f given by $f(x) = 2x^3 - 3x^2 - 12x$ has a local minimum at $x =$

(A) -1 (B) 0 (C) 2 (D) $\dfrac{3 - \sqrt{105}}{4}$ (E) $\dfrac{3 + \sqrt{105}}{4}$

_____ 2. Let f be the function given by $f(x) = x^3 - 6x^2$. The graph of f is concave up when

(A) $x > 2$ (B) $x < 2$ (C) $0 < x < 4$ (D) $x < 0$ or $x > 4$ only   (E) $x > 6$ only

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

   I.   A relative maximum at $x = 2$
   II. A relative minimum at $x = 3$
   III. A relative maximum at $x = 4$

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

_____ 4. For $x > 0$, f is a function such that $f'(x) = \dfrac{\ln x}{x}$ and $f''(x) = \dfrac{1 - \ln x}{x^2}$. Which of the following is

true?

(A) f is decreasing for $x > 1$, and the graph of f is concave down for $x > e$
(B) f is decreasing for $x > 1$, and the graph of f is concave up for $x > e$
(C) f is increasing for $x > 1$, and the graph of f is concave down for $x > e$
(D) f is increasing for $x > 1$, and the graph of f is concave up for $x > e$
(E) f is decreasing for $0 < x < 1$, and the graph of f is concave down for $0 < x < e^{3/2}$
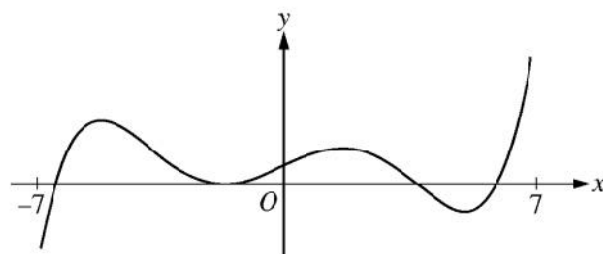
Graph of f'

_____5. The figure above shows the graph of f', the derivative of the function f on the open interval
$-7 < x < 7$. If f' has four zeros on $-7 < x < 7$, how many relative maxima does f have on
$-7 < x < 7$?

(A) one   (B) two   (C) three   (D) four   (E) five

x	0	1	2	3
$f''(x)$	5	0	−7	4

_____ 6. The polynomial function f has selected values of its second derivative f'' given in the table above. Which of the following statements must be true?

(A) f is increasing on the interval $(0,2)$ (B) f is decreasing on the interval $(0,2)$

(C) f has a local maximum at $x=1$ (D) The graph of f has a point of inflection at $x=1$

(E) The graph of f changes concavity in the interval $(0,2)$

_____ 7. Let f be a function with a second derivative given by $f''(x)=x^2(x-3)(x-6)$. What are the x-coordinates of the points of inflection of the graph of f?

(A) 0 only   (B) 3 only   (C) 0 and 6 only   (D) 3 and 6 only   (E) 0, 3, and 6 only

Part II: Free Response
Say what you want, but be sure to document and say it correctly with correct documentation.

2011 AB4 Form B

10. Consider a differentiable function f having domain of all positive real numbers, and for which it is known that $f'(x) = (4-x)x^{-3}$ for $x > 0$.

(a) If $f(1) = 2$, write an equation of the tangent line to $f(x)$ at $x = 1$.

(b) Find the x-coordinate of the critical point of f. Determine whether the point is a relative maximum, a relative minimum, or neither for the function f. Justify your answer.

(c) Find all intervals on which the graph of f is concave down. Justify your answer.