Name_____ Date_____ Evergreen Tree_____

TEST: 3.1-3.4, NO CALCULATOR

Part I: Multiple Choice—Put the CAPITAL letter of the correct answer in the space to the left of the question number.

_____ 1. Find the local minimum value or the local maximum value of $y = x^3 - 6x^2 + 9x + 1$.
(A) local max of 5 (B) local max of 1 (C) local max of 3 (D) local min of 5 (E) local min of -3

_____ 2. The function $f(x) = x^3 - 3x^2 + 3$ has an inflection point at
(A) $(0,3)$ (B) $(1,3)$ (C) $(2,-1)$ (D) $(1,1)$ (E) Does not have one

_____ 3. Find the absolute minimum value or the absolute maximum value of $f(x) = -3x + 4$ on the interval $(-1,2]$.
(A) max of 7 (B) max of -2 (C) min of 7 (D) min of -2 (E) neither exist

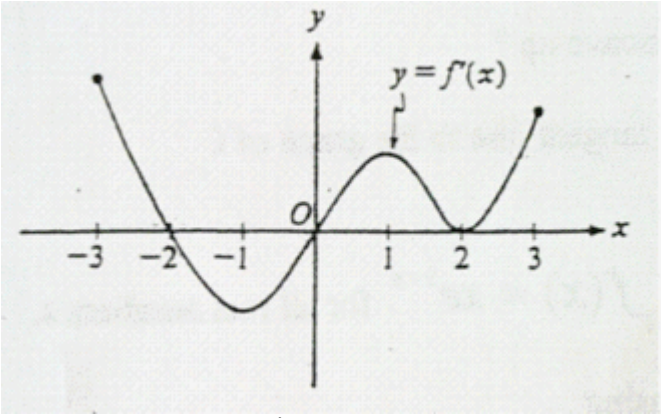
_____ 4. The f be a function such that it is continuous on $[a,b]$, it is differentiable on (a,b), and $f(a) = f(b)$, then there exists a number c in (a,b) such that $f'(0) = 0$. This theorem is known as:
(A) Extreme Value Theorem (B) Intermediate Value Theorem (C) Mean Value Theorem
(D) Rolle's Theorem (E) Fundamental Theorem of Calculus

_____ 5. How many critical values of the function f defined by $f(x)=\dfrac{x}{x^2-9}$ are there?

(A) none (B) 1 (C) 2 (D) 3 (E) 4

_____ 6. Let $f''(x)=x(x-3)^2(x+5)$, the second-derivative of a continuous function $f(x)$, on what open interval is the graph of $f(x)$ concave down?

(A) $(-\infty,-5)\cup(-3,\infty)$ (B) $(-\infty,-5)\cup(0,\infty)$ (C) $(0,3)$ (D) $(-5,0)$ (E) $(-\infty,-5)$



_____ 7. The figure above shows the graph of f', the derivative of the function f on the closed interval $-3\le x\le 3$. If f' has 3 zeros on $-3<x<3$, how many relative/local extrema does f have on $-3<x<3$?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

x	$f(x)$	$f'(x)$	$f''(x)$
-3	5	8	8
-2	3	-12	0
1	2	0	-5
5	1	4	4

_____ 8. The table above gives select values for a twice-differentiable function $f(x)$. Which of the following must be true regarding $f(x)$?

(A) $f(x)$ has a local maximum at $x=1$.

(B) $f(x)$ has a local minimum at $x=1$

(C) $f(x)$ has an inflection value at $x=-2$

(D) $f(x)$ is decreasing on $(-3,1)$

(E) $f(x)$ is concave up on $(-8,0)$

_____ 9. Find the value that satisfies the conclusion of the Mean Value Theorem for derivatives for the function $f(x)=3x^2-5x+1$ on the interval $[2,5]$.

(A) 1 (B) $\frac{13}{6}$ (C) $\frac{11}{6}$ (D) $\frac{23}{6}$ (E) $\frac{7}{2}$

Part II: Free Response—Show all work with correct notation in the space provided.

10. Consider a differentiable function $f(x)$ having domain of all positive real numbers, and for which it is known that $f'(x)=(6-x)x^{-2}$ for $x>0$.

(a) If $f(5)=2$, write an equation of the tangent line to $f(x)$ at $x=5$.

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

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