1. The graph of $y = 3x^2 - x^3$ has a relative maximum at

(A) $(0,0)$ only (B) $(1,2)$ only (C) $(2,4)$ only (D) $(4,-16)$ only (E) $(0,0)$ & $(2,4)$

2. Let $f(x) = \begin{cases} 1+e^{-x} & 0 \le x \le 5 \\ 1+e^{x-10} & 5 < x \le 10 \end{cases}$. Which of the following statements are true?

I. $f(x)$ is continuous for all values of x in the interval $[0,10]$.

II. $f'(x)$, the derivative of $f(x)$, is continuous for all values of x in the interval $[0,10]$.

III. The graph of $f(x)$ is concave upwards for all values of x in the interval $[0,10]$.

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

3. Let f be a function that is everywhere differentiable. The value of $f'(x)$ is given for several values of x in the table below. If $f'(x)$ is always increasing, which statement about $f(x)$ must be true?

x	-10	-5	0	5	10
$f'(x)$	-2	-1	0	1	2

(A) f has a relative minimum at $x=0$. (B) f is concave downwards for all x. (C) f has a point of inflection at $(0, f(0))$ (D) f passes through the origin. (E) f is an odd function.

4. The equation of the horizontal asymptote for the graph of $y = \dfrac{2 - e^{\frac{1}{x}}}{2 + e^{\frac{1}{x}}}$ is

(A) $y = -1$ (B) $y = -\frac{1}{2}$ (C) $y = \frac{1}{3}$ (D) $y = \frac{1}{2}$ (E) $y = 1$

5. What are all values of x for which the graph of $y = x^3 - 6x^2$ is concave downward?

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

6. Let f be a differentiable function defined for all real numbers. The table below gives the value of f and its derivative f' for several values of x. Which of the following statements are true?

x	-3	-2	-1	0	1	2	3
$f(x)$	8	5	0	1	0	5	8
$f'(x)$	-6	-4	-2	0	2	4	6

I. At $x = 2$, the function is increasing.

II. There is a relative minimum in the interval $-1 \le x \le 1$, but not necessarily at $x = 0$.

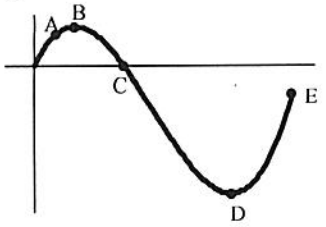
III. There is a relative maximum in the interval $-1 \le x \le 1$.

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

7. If the graph of $y = x^3 + ax^2 + bx - 8$ has a point of inflection at (2, 0), what is the value of b?

(A) 0 (B) 4 (C) 8
(D) 12 (E) The value of b cannot be determined from the given information.

8. The figure below shows the graph of the velocity of a moving object as a function of time. At which of the marked points is the speed the greatest?



(A) A (B) B (C) C (D) D (E) E

9. A function f has a vertical asymptote at $x = 2$. The derivative of f is positive for all $x \neq 2$. Which of the following statements are true?

I. $\lim_{x\to 2} = \infty$

II. $\lim_{x\to 2^+} = \infty$

III. $\lim_{x\to 2^-} = \infty$

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

10. The absolute minimum value of $R(x) = \dfrac{3x-1}{x+2}$ on $[0,2]$ is:

(A) 0 (B) 2 (C) $-\frac{1}{2}$ (D) $\frac{3}{4}$ (E) -2

11. The total number of relative extrema of the function $H(x)$ whose derivative for all x is given by $H'(x) = 3x(x-5)(2x-3)^2(3x-4)^4$ is:

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

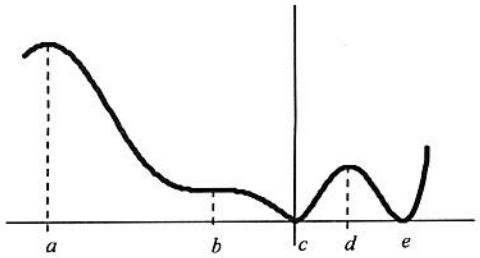
12. The equation of the tangent to the curve $y = x^3 - x^2 + 2x$ at its point of inflection is:

(A) $y = 2x$ (B) $23x - y = 45$ (C) $45x - 27y = -1$ (D) $9x - 27y = -13$ (E) $63x - 27y = 5$

13 The function $f(x) = \dfrac{x^3 - 2x + 1}{(1-x)^2}$ has an oblique asymptote:

(A) $y = x$ (B) $y = x - 2$ (C) $y = x + 2$ (D) $y = 2 - x$ (E) $y = x - 3$

14. On the graph below, which indicated x-value would satisfy $f''(x) > 0$ when $f'(x) = 0$?



(A) a (B) b (C) c (D) d (E) e

ANSWERS

1. C 2.D 3.A 4.C 5.C 6.E 7.D 8.D 9.C 10. C 11. C 12. C 13. C 14. E