1. What is the x-coordinate of the point of inflection on the graph of $y = xe^x$?

(A) -2 (B) -1 (C) 0 (D) 1 (E) 2

Ans

1. If the function f is defined by $f(x) = e^x(x^2 + 1)$, how many points of inflection exist on the graph of f?

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

Ans

16. The graph of $y = 3x^5 - 10x^4$ has an inflection point at

(A) $(0, 0)$ and $(2, -64)$

(B) $(0, 0)$ and $(3, -81)$

(C) $(0, 0)$ only

(D) $(-3, 81)$ only

(E) $(2, -64)$ only

Ans
☐

19. The function defined by $f(x) = (x-1)(x+2)^2$ has inflection points at $x =$

(A) -2 only

(B) -1 only

(C) 0 only

(D) -2 and 0 only

(E) -2 and 1 only

13. Let $f(x) = x^4 + ax^2 + b$. The graph of f has a relative maximum at $(0, 1)$ and an inflection point when $x = 1$. The values of a and b are

(A) $a = 1, \quad b = -6$

(B) $a = 1, \quad b = 6$

(C) $a = -6, \quad b = 5$

(D) $a = -6, \quad b = 1$

(E) $a = 6, \quad b = 1$

Ans

☐

4. On which of the following intervals, is the graph of the curve $y = x^5 - 5x^4 + 10x + 15$ concave up ?

I. $x < 0$ II. $0 < x < 3$ III. $x > 3$

(A) I only

(B) II only

(C) III only

(D) I and II only

(E) II and III only

Ans

4. The graph of $y = \dfrac{-5}{x - 2}$ is concave downward for all values of x such that

(A) $x < 0$ (B) $x < 2$ (C) $x < 5$ (D) $x > 0$ (E) $x > 2$

$y' = -5(x-2)^{-1} = 5(x-2)^{-2} = \dfrac{5}{(x-2)^2}$ $y'' = -10(x-2)^{-3}$

9. On which interval is the graph of $f(x) = 4x^{3/2} - 3x^2$ both concave down and increasing?

(A) $(0, 1)$

(B) $\left(0, \frac{1}{2}\right)$

(C) $\left(0, \frac{1}{4}\right)$

(D) $\left(\frac{1}{4}, \frac{1}{2}\right)$

(E) $\left(\frac{1}{4}, 1\right)$

Ans

22. If $f(x) = x^3 - 5x^2 + 3x$, then the graph of f is decreasing and concave down on the interval

(A) $\left(0, \frac{1}{3}\right)$ (B) $\left(\frac{1}{3}, \frac{2}{3}\right)$ (C) $\left(\frac{1}{3}, \frac{5}{3}\right)$ (D) $\left(\frac{5}{3}, 3\right)$ (E) $(3, \infty)$

Ans

23. If $f(x) = \frac{x^2+1}{e^x}$, then the graph of f is decreasing and concave down on the interval

(A) $(-\infty, 0)$ (B) $(0, 1)$ (C) $(1, 3)$ (D) $(3, 4)$ (E) $(4, \infty)$

Ans

☐

8. The graph of $y = x^4 - x^2 - e^{2x}$ changes concavity at $x =$

(A) -0.641 (B) -0.531 (C) -0.421 (D) -0.311 (E) -0.201

Ans

7. An equation of the line tangent to the graph of $y = x^3 + 3x^2 + 2$ at its point of inflection is

(A) $y = -3x + 1$

(B) $y = -3x - 7$

(C) $y = x + 5$

(D) $y = 3x + 1$

(E) $y = 3x + 7$

Ans

14. If $f(x)$ is defined on $-\pi \le x \le \pi$ and $\dfrac{dy}{dx} = \dfrac{\cos x}{x^2 + 1}$, which of the following statements about the graph of $y = f(x)$ is true?

(A) The graph has no relative extremum.

(B) The graph has one point of inflection and two relative extrema.

(C) The graph has two points of inflection and one relative extremum.

(D) The graph has two points of inflection and two relative extrema.

(E) The graph has three points of inflection and two relative extrema.

14. Suppose the continuous function f is defined on the closed interval $[0, 3]$ such that its derivative f' is defined by $f'(x) = e^x \sin(x^2) - 1$. Which of the following are true about the graph of f?

    I. f has exactly one relative maximum point.
    II. f has two relative minimum points.
    III. f has two inflection points.

(A) I only

(B) II only

(C) III only

(D) I and II only

(E) I, II, III

15. At $x = 0$, which of the following is true of the function f defined by $f(x) = \dfrac{x^2}{1+\sin x} + e^{-2x}$?

(A) f is discontinous

(B) f is increasing

(C) f is decreasing

(D) f has a relative minimum

(E) f has a relative maximum

Ans

☐

17. Which of the following is true about the graph of $f(x) = \ln\left|x^2 - 4\right|$ in the interval $(-2, 2)$?

(A) f is increasing.

(B) f attains a relative minimum at $(0, 0)$.

(C) f has a range of all real numbers.

(D) f is concave down.

(E) f has an asymptote at $x = 0$.

Ans

◻