# ABHINAV ACADEMY

**UDUPI**

## CET25M6

### Class 12 - Mathematics

**Time Allowed: 1 hour and 30 minutes** **Maximum Marks: 75**

1. If $xy = a^2$ and $S = b^2x + c^2y$ where a, b and c are positive constants then the minimum value of S is **[1]**

   a) 2abc
   b) $bc\sqrt{a}$
   c) 2abc
   d) abc

2. The maximum value of the function $f(x) = x^3 + 2x^2 - 4x + 6$ exists at **[1]**

   a) x = -1
   b) x = 1
   c) x = -2
   d) x = 2

3. The least value of $f(x) = (e^x + e^{-x})$ is **[1]**

   a) 2
   b) -2
   c) 0
   d) 1

4. Function f(x) = |x| - |x - 1| is monotonically increasing when **[1]**

   a) x < 1
   b) 0 < x < 1
   c) x < 0
   d) x > 1

5. The function $f(x) = x^9 + 3x^7 + 64$ is increasing on **[1]**

   a) $(-\infty , 0)$
   b) $R_0$
   c) $(0 , \infty)$
   d) R

6. The maximum value of $f(x) = \frac{x}{4+x+x^2}$ on [-1, 1] is **[1]**

   a) $-\frac{1}{4}$
   b) $\frac{1}{5}$
   c) $\frac{1}{6}$
   d) $-\frac{1}{3}$

7. In a sphere of radius r, a right circular cone of height h having maximum curved surface area is inscribed. The expression for the square of curved surface of cone is **[1]**

   a) $2\pi^2rh(2rh + h^2)$
   b) $2\pi^2r^2(2rh - h^2)$
   c) $\pi^2hr(2rh + h^2)$
   d) $2\pi^2r(2rh^2 - h^3)$

8. Let f(x) be a function such that $f'(a) \neq 0$. Then at x = a, f(x) **[1]**

   a) cannot have a maximum
   b) cannot have a minimum
   c) must have neither a maximum nor a minimum
   d) none of these

9. $f(x) = \frac{x}{(x^2+1)}$ is increasing in **[1]**

a) (-1, 0)

b) $(-1, \infty)$

c) $(-\infty, -1) \cup (1, \infty)$

d) (-1, 1)

10. Every invertible function is **[1]**

a) not necessarily monotonic function

b) identity function

c) constant function

d) monotonic function

11. If the function f (x) = 2 tan x + (2a + 1) $\log_e$ |sec x| + (a - 2) x is increasing on R, then **[1]**

a) a = $\frac{1}{2}$

b) $a \in R$

c) $a \in (\frac{1}{2}, \infty)$

d) $a \in (-\frac{1}{2}, \frac{1}{2})$

12. The values of x for which y = $[x(x - 2)]^2$ is an increasing function, are **[1]**

a) 0 < x < 2 and x > 3

b) 0 < x < $\frac{3}{2}$ and x > 4

c) 0 < x < 1 and x > 2

d) 0 < x < $\frac{1}{2}$ and x > $\frac{3}{2}$

13. If the total cost P(x) in ₹ associated with an item is given by P(x) = $0.4x^2$ + 2x - 10, then the marginal cost if no. of units produced is 10 is **[1]**

a) ₹ 8

b) ₹ 10

c) ₹ 7

d) ₹ 2

14. f(x) = 1 + 2 sin x + 3 $\cos^2$x, $0 \leq x \leq \frac{2\pi}{3}$ is **[1]**

a) Minimum at x = $\frac{\pi}{2}$

b) Maximum at $\sin^{-1}(\frac{1}{6})$

c) Minimum at x = $\frac{\pi}{6}$

d) Maximum at x = $\sin^{-1}(\frac{1}{\sqrt{3}})$

15. The function f(x) = $\frac{-x}{2}$ + sin x defined on $[\frac{-n}{3}, \frac{71}{3}]$ is **[1]**

a) Falls

b) decreasing

c) increasing

d) constant

16. The function f(x) = |x| has **[1]**

a) only one maxima

b) only one minima

c) no maxima or minima

d) only two maxima

17. The rate of change of area of square is 40 $cm^2$/s. What will be the rate of change of side if the side is 5 cm. **[1]**

a) 8 cm/s

b) 2 cm/s

c) 4 cm/s

d) 6 cm/s

18. The critical points for the function f(x) = $x^3$ - $2x^2$ + x + 1 are **[1]**

a) 1, 0

b) 4, 3

c) 2, 1

d) 1, $\frac{1}{3}$

19. If a > b > 0, the minimum value of a sec $\theta$ - b tan $\theta$ is **[1]**

a) $2\sqrt{a^2 - b^2}$

b) $\sqrt{a^2 + b^2}$

c) $\sqrt{a^2 - b^2}$

d) b - a

**[1]**

20. The function f(x) = 4 - 3x + $3x^2$ - $x^3$ is decreasing

a) Strictly decreasing on R

b) Strictly increasing on R

c) Decreasing on R

d) Increasing on R

21. Let $\phi(x)$ = f(x) + f(2a - x) and f(x)> 0 for all x$\in [0, a]$ then $\phi(x)$ **[1]**

a) decreases on [0, a]

b) increases on [ - a , 0]

c) increases on [0, a]

d) decreases on [a, 2a]

22. If f(x) = $\frac{x}{\sin x}$ and g(x) = $\frac{x}{\tan x}$, where 0 < x $\leq$ 1, then in the interval **[1]**

a) f(x) is an increasing function

b) both f(x) and g(x) are increasing functions

c) both f(x) and g(x) are decreasing functions

d) g(x) is an increasing function

23. Let f(x) = x|x|, then f (x) has **[1]**

a) point of inflexion at x = 0

b) point of inflexion at x = 1

c) local minima at x = 0

d) local maxima at x = 0

24. The function f(x) = $\frac{5}{x} - 9$ is of which nature for x $\in$ R, (x $\neq$ 0). **[1]**

a) strictly decreasing

b) increasing

c) strictly increasing

d) decreasing

25. If $\theta + \phi = \frac{\pi}{3}$ then sin $\theta$ sin $\phi$ has a maximum value of $\theta$ is **[1]**

a) $\frac{\pi}{4}$

b) $\pi$

c) $\frac{\pi}{6}$

d) $\frac{2\pi}{3}$

26. The maximum value of slope of the curve y = -$x^3$ + $3x^2$ + 12x - 5 is: **[1]**

a) 9

b) 15

c) 0

d) 12

27. The function f(x) = $\frac{\lambda \sin x + 2\cos x}{\sin x + \cos x}$ is increasing, if, **[1]**

a) $\lambda > 1$

b) $\lambda > 2$

c) $\lambda < 2$

d) $\lambda < 1$

28. Let f(x) = (x - a)$^2$ + (x - b)$^2$ + (x - c)$^2$. Then f(x) has a minimum at x = **[1]**

a) $\frac{a+b+c}{3}$

b) $3\sqrt{abc}$

c) $6\sqrt{abc}$

d) $\frac{3}{\frac{1}{a}+\frac{1}{b}+\frac{1}{c}}$

29. The values of a for which the function f(x) = sin x - ax + b increases on R are **[1]**

a) $(-\infty, \infty)$

b) [1, 1]

c) (-$\infty$, -1)

d) [-1, 1]

30. When x is positive, the minimum value of $x^x$ is **[1]**

a) $e^{\frac{-1}{e}}$

b) $e\frac{1}{e}$

c) $\frac{1}{e}$

d) $e^e$

31. Find the intervals in which f(x) = - $x^2$ - 2x + 15 is increasing or decreasing **[1]**

a) Decreasing($-\infty$, -4)
Increasing (-4, $\infty$)

b) Increasing ($\infty$, -2)
Decreasing (0, $\infty$)

c) Increasing ($-\infty$, -1)
Decreasing (-1, $\infty$)

d) Increasing ($-\infty$, -4)
Decreasing (-4, $\infty$)

32. Let x, y be two variables and x > 0, xy = 1 then minimum value of x + y is **[1]**

a) 2

b) $2\frac{1}{2}$

c) $3\frac{1}{3}$

d) 1

33. Find the angle of intersection of the two curves $x^2y = 2$ and $xy^2 = 4$ **[1]**

a) $\tan^{-1} 3$

b) $\tan^1 \frac{3}{5}$

c) $\tan^{-1} \frac{5}{3}$

d) $\tan^{-1} \frac{3}{5}$

34. $f(x) = (x + 1)^3 (x - 3)^3$ is increasing in **[1]**

a) $(1, \infty)$

b) (-1, 3)

c) $(-\infty, 1)$

d) $(3, \infty)$

35. Which of the following is true for the function f(x) = 9x - 5? **[1]**

a) f(x) is strictly increasing on R

b) f(x) is decreasing on R

c) Both f(x) increasing on R and f(x) decreasing on R are false

d) f(x) is strictly decreasing on R

36. The edge of a cube is increasing at a rate of 7 cm/s. Find the rate of change of area of the cube when a = 3cm. **[1]**

a) 498 $cm^2/s$

b) 287 $cm^2/s$

c) 252 $cm^2/s$

d) 504 $cm^2/s$

37. f(x) = sin x $\sqrt{3}$ cos x is maximum when x = **[1]**

a) $\frac{\pi}{6}$

b) $\frac{\pi}{4}$

c) 0

d) $\frac{\pi}{3}$

38. If $f(x) = 4x^2 + 2x + 1$, then its maximum value is **[1]**

a) 1

b) $\frac{4}{3}$

c) $\frac{3}{4}$

d) $\frac{2}{3}$

39. The sum of two non-zero numbers is 8, the minimum value of the sum of their reciprocals is **[1]**

a) $\frac{1}{2}$

b) $\frac{1}{8}$

c) $\frac{1}{4}$

d) $\frac{1}{6}$

40. $f(x) = 2x - \tan^{-1} x - \log \{x + \sqrt{x^2 + 1}\}$ is monotonically increasing when **[1]**

a) $x \in R$

b) x > 0

c) $x \in R - (0)$

d) x < 0

41. If $f(x) = x + \frac{1}{x}$, x > 0, then its greatest value is **[1]**

a) -2

b) none of these

c) 0

d) 3

42. The function f(x) = tan x - x **[1]**

a) never increases

b) sometimes increases and sometimes decreases

c) always increases

d) always decreases

43. $f(x) = x^x$ has a stationary point at **[1]**

a) x = 1

b) $x = \sqrt{e}$

c) x = e

d) $x = \frac{1}{e}$

44. The function $f(x) = x^3 - 6x^2 + 9x + 3$ is decreasing for **[1]**

a) -1 < x < -3

b) x > 1

c) x < 1

d) x < 1 or x > 3

45. Interval(s) in which the function f(x) = sin x + cos x, $x \in \left(0, \frac{\pi}{2}\right)$ is strictly increasing **[1]**

a) $\left(0, \frac{\pi}{4}\right)$

b) $\left(\pi, \frac{\pi}{2}\right)$

c) $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

d) $\left(0, \frac{\pi}{2}\right)$

46. The least and greatest values of $f(x) = x^3 - 6x^2 + 9x$ in [0, 6], are **[1]**

a) none of these

b) 0,6

c) 3,6

d) 0,3

47. It is given that for the function f given by $f(x) = x^3 + bx^2 + ax$, $x \in [1, 3]$, then **[1]**

a) a = -6, b = -11

b) a = - 6, b = 11

c) a = 11, b = -6

d) a = 6, b = 11

48. The number of values of x where the function $f(x) = \cos x + \cos(\sqrt{2}x)$ attains its maximum is **[1]**

a) 2

b) infinite

c) 1

d) 0

49. $a \log x + bx^2 + x$ has its extreme values at x =– 1 and x = 2, then **[1]**

a) a = 2, b = $-\frac{1}{2}$

b) a = 2, b = – 1

c) a = -2,b = $-\frac{1}{2}$

d) a = -2, b = $\frac{1}{2}$

50. The function $f(x) = x^x$ decreases on the interval **[1]**

a) (0, e)

b) (0, 1)

c) (1/e,e)

d) $(0 , \frac{1}{e})$

51. The function $f(x) = 2x^3 - 15x^2 + 36x + 6$ is increasing in the interval **[1]**

a) $(-\infty, 2)$

b) $(-\infty, 2] \cup [3, \infty)$

c) $(-\infty, 2) \cup (3, \infty)$

d) $(3, \infty)$

52. The function f(x) = cos x -2 $\lambda x$ is monotonic decreasing when **[1]**

a) $\lambda > 2$ b) $\lambda < 1/2$

c) $\lambda > 1/2$ d) $\lambda < 2$

53. Function f(x) = $\log_a$ x is increasing on R , if **[1]**

a) a < 1 b) 0 < a < 1

c) a > 1 d) a > 0

54. The function f (x) = $x^3$ - 3x has a **[1]**

a) local minima at x = 1 b) local maxima at x = 1

c) point of inflexion at 0 d) point of inflexion at 1

55. Let f(x) = $2x^3$ - $3x^2$ - 12x + 5 on [-2, 4]. The relative maximum occurs at x = **[1]**

a) 2 b) -1

c) 4 d) -2

56. f(x) = $[x(x - 3)]^2$ is increasing in **[1]**

a) $(-\infty, 0)$ b) $\left(0, \frac{3}{2}\right) \cup (3, \infty)$

c) (1, 3) d) $(0, \infty)$

57. The function f(x) = $\log_e \left(x^3 + \sqrt{x^6 + 1}\right)$ is of the following types: **[1]**

a) even and increasing b) odd and decreasing

c) even and decreasing d) odd and increasing

58. The minimum value of f(x) = 3 $\cos^2$x + 4 $\sin^2$x + $\cos\frac{x}{2}$ + $\sin\frac{x}{2}$ is **[1]**

a) 4 + $\sqrt{2}$ b) 3 + $\sqrt{2}$

c) 4 - $\sqrt{2}$ d) 4

59. f(x) = sin x - kx is decreasing for all x $\in$ R, when **[1]**

a) $k \geq 1$ b) k < 1

c) k > 1 d) $k \leq 1$

60. The total revenue received from the sale of x units of a product is given by: R(x) = $5x^3$ - $4x^2$, find the marginal revenue of x = 20. **[1]**

a) 5860 b) 5840

c) 5000 d) 5600

61. The function f(x) = 4 $\sin^3$x - 6 $\sin^2$x + 12 sinx + 100 is strictly **[1]**

a) increasing in $\left(\pi, \frac{3\pi}{2}\right)$ b) decreasing in $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

c) decreasing in $\left(\frac{\pi}{2}, \pi\right)$ d) decreasing in $\left[0, \frac{\pi}{2}\right]$

62. If the function f(x) = $x^3$ - $9kx^2$ + 27x + 30 is increasing on R, then **[1]**

a) 0 < k < 1 b) -1 < k < 1

c) k < - 1 or k > 1 d) -1 < k < 0

63. If the function f(x) = $kx^3 - 9x^2 + 9x + 3$ is monotonically increasing in every interval, then **[1]**

a) k > 3 b) k < 3

c) $k \geq 3$ d) $k \leq 3$

64. f(x) = sin x is increasing in **[1]**

a) $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ b) $\left(\pi, \frac{3\pi}{2}\right)$

c) $(0, \pi)$ d) $\left(\frac{\pi}{2}, \pi\right)$

65. The maximum value of $\left(\frac{1}{x}\right)^x$ is: **[1]**

a) $\left(\frac{1}{e}\right)^{\frac{1}{e}}$ b) $e^e$

c) e d) $e^{1/e}$

66. Let $f(x) = x^{25}(1 - x)^{75}$ for all $x \in [0, 1]$, then f (x) assumes its maximum value at **[1]**

a) $\frac{1}{3}$ b) $\frac{1}{2}$

c) $\frac{1}{4}$ d) 0

67. The function $f(x) = x^2$ is strictly decreasing in the interval. **[1]**

a) (1, 4) b) (0, $\infty$)

c) ($-\infty$, 0) d) (-1, $\infty$)

68. f(x ) = cosec x in (- $\pi$, 0) has a maxima at **[1]**

a) $x = \frac{-\pi}{2}$ b) x = 0

c) $x = \frac{-\pi}{3}$ d) $x = \frac{-\pi}{4}$

69. The maximum and minimum values of the function $2x^3 - 15x^2 + 36x + 11$ are respectively **[1]**

a) 39, 35 b) 39, 18

c) 38, 37 d) 39, 38

70. The function f(x) = 2log (x - 2) - $x^2$ + 4x + 1 increases on the interval **[1]**

a) $(1, 2) \cup (3, \infty)$ b) (2 ,4)

c) $(-\infty, 1) \cup (2, 3)$ d) (1 , 3)

71. The function given f(x) = $e^{2x}$ is ...A... on R. Here, A refers to _____. **[1]**

a) neither increasing nor decreasing b) Decreasing

c) strictly increasing d) strictly decreasing

72. Maximum value of x + cos x in $\left[0, \frac{\pi}{2}\right]$ is **[1]**

a) $\frac{\pi}{2} + 1$ b) $\frac{\pi}{2} - 1$

c) $-1 + \pi$ d) $\frac{\pi}{2}$

73. The least value of k for which f(x) = $x^2$ + kx +1 is increasing on (1, 2), is **[1]**

a) -2 b) 2

c) 1 d) -1

74. A function f : R $\rightarrow$ R is defined as f(x) = $x^3$ + 1.Thenthe function has **[1]**

a) both maximum and minimum values

b) neither maximum value nor minimum value

c) no minimum value

d) no maximum value

75. Function f(x) = $a^x$ is increasing on R, if **[1]**

a) a > 0

b) a < 0

c) a > 1

d) 0 < a < 1