Question Bank

APPLICATIONS OF DERIVATIVES MCQS

Class 12 - Mathematics

1.	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	
2.	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) $e^{1/e}$	
3.	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) none of these	
4.	maximum value of $f(x)$ =sinx in [π ,2 π] is	5	[1]
	a) 0	b) $\frac{1}{\sqrt{2}}$	
	c) 1	d) none of these	
5.	If the function $f(x) = \cos x - 2ax + b$ in	creases along the entire number scale, then	[1]
	a) $a>-rac{3}{2}$	b) $a=rac{1}{2}b$	
	c) $a\leq -rac{1}{2}$	d) a = b	
6.	Function $f(x) = x - x - 1 $ is monotonical	ally increasing when	[1]
	a) x < 1	b) 0 < x < 1	
	c) x < 0	d) x > 1	
7.	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	
8.	The function f(x) = cos x -2 λx is mono	tonic decreasing when	[1]
	a) $\lambda>2$	b) $\lambda < 1/2$	
	c) $\lambda > 1/2$	d) $\lambda < 2$	
9.	The least value of $f(x) = (e^x + e^{-x})$ is		[1]
	a) 2	b) -2	
	c) 0	d) None of these	
10.	$f(x) = [x(x - 3)]^2$ is increasing in		[1]

	a) $(-\infty,0)$	b) $\left(0,rac{3}{2} ight)\cup(3,\infty)$	
	c) (1, 3)	d) $(0,\infty)$	
11.	If ax + $\frac{b}{x} \ge c$ for all positive x where a, b, > 0, then		[1]
	a) ab < $\frac{c^2}{4}$	b) ab $\geq \frac{c^2}{4}$	
	c) ab $\geq \frac{c}{4}$	d) none of these	
12.	The minimum value of sin x \cdot cos x is		[1]
	a) $2\sqrt{2}$	b) $\frac{1}{2}$	
	c) $\frac{1}{4}$	d) $\sqrt{2}$	
13.	The minimum value of $f(x) = 3x^4 - 8x^3 - 48x + 25$ on	[0, 3] is	[1]
	a) 25	b) 16	
	c) -39	d) None of these	
14.	At $x = \frac{5\pi}{6}$, f(x) = 2 sin3x + 3 cos3x is:		[1]
	a) zero	b) maximum	
	c) minimum	d) neither maximum nor minimum	
15.	The function $f(x) = \cot^{-1} x + x$ increases in the interval	al	[1]
	a) 0 , ∞	b) - ∞ , ∞	
	c) (1, ∞)	d) -1, ∞	
16.	The function $f(x) = x^2 e^{-x}$ is Monotonic increasing wh	en	[1]
	a) $\mathbf{x} \in \mathbf{R}$ - [0, 2]	b) 0 < X < 2	
	c) 2< X < ∞	d) X < 0	
17.	The maximum value of $f(x) = (x - 2) (x - 3)^2$ is		[1]
	a) $\frac{7}{3}$	b) 0	
	c) $\frac{4}{27}$	d) 3	
18.	The function $f(x) = x $ has		[1]
	a) only one maxima	b) only one minima	
	c) no maxima or minima	d) none of these	
19.	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) $a = -2, b = \frac{1}{2}$	
20.). $f(x) = 2x - \tan^{-1} x - \log \{x + \sqrt{x^2 + 1}\}$ is monotonically increasing when		[1]
	a) $\mathbf{x} \in \mathbf{R}$	b) x > 0	
	c) $x \in R$ - (0)	d) x < 0	
21.	The function $f(x) = x^9 + 3x^7 + 64$ is increasing on		[1]

	a) (- ∞ , 0)	b) R ₀	
	c) $(0,\infty)$	d) R	
22.	The smallest value of the polynomial x^3 - $18x^2$ + 9	96x in [0, 9] is	[1]
	a) 126	b) 160	
	c) 135	d) 0	
23.	Function $f(x) = a^x$ is increasing on R, if		[1]
	a) a > 0	b) a < 0	
	c) a > 1	d) 0 < a < 1	
24.	Maximum value of x + cos x in $\left[0, \frac{\pi}{2}\right]$ is		[1]
	a) none of these	b) $\frac{\pi}{2} - 1$	
	c) – 1 + π	d) $\frac{\pi}{2}$	
25.	Which of the following functions is decreasing on	$\left(0, \frac{\pi}{2}\right)$	[1]
	a) cos x	b) cos 3x	
	c) tan x	d) sin 2x	
26.	The maximum value of $rac{\log x}{x}$ in $0 < x < \infty$ is		[1]
	a) 0	b) none of these	
	с) — е	d) $\frac{1}{e}$	
27.	The function $f(x) = 4 - 3x + 3x^2 - x^3$ is decreasing		[1]
	a) Strictly decreasing on R	b) Strictly increasing on R	
	c) Decreasing on R	d) Increasing on R	
28.	The total revenue in Rupees received from the sale of x units of a product is given by		[1]
	$R(x) = 3x^2 + 36x + 5$. The marginal revenue, when $x = 15$ is		
	a) 96	b) 90	
	c) 116	d) 126	
29.	The minimum value of $\left(x^2+rac{250}{x} ight)$ is		[1]
	a) 25	b) 55	
	c) 50	d) 75	
30.	If x is real, the minimum value of $x^2 - 8x + 17$ is		[1]
	a) 2	b) 0	
	c) – 1	d) 1	
31.	Let $f(x) = 2x^3 - 3x^2 - 12x + 5$ on [-2, 4]. The relative	ve maximum occurs at x =	[1]
	a) 2	b) -1	
	c) 4	d) -2	
32.	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) none of these	
33.	The function $f(x) = 2x^3 - 15x^2 + 36x + 4$ is maximum	n at x =	[1]
	a) 2	b) 4	
	c) 0	d) 3	
34.	The function $f(x) = \frac{-x}{2} + \sin x$ defined on $\left[\frac{-n}{3}, \frac{71}{3}\right]$ i	S	[1]
	a) none of these	b) decreasing	
	c) increasing	d) constant	
35.	If the function $f(x) = kx^3 - 9x^2 + 9x + 3$ is monotonic	cally increasing in every interval, then	[1]
	a) k > 3	b) k < 3	
	c) $k\geq 3$	d) $k\leq 3$	
36.	Let $f(x) = x^3$, then $f(x)$ has a		[1]
	a) point of inflexion at $x = 0$	b) local maxima at x = 0	
	c) none of these	d) local minima at $x = 0$	
37.	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) $a\in (rac{1}{2},\infty)$	d) $a\in(-rac{1}{2},rac{1}{2})$	
38.	The minimum value of the function $f(x) = 2x^3 - 21x^2$	+ 36x - 20 is	[1]
	a) -128	b) -120	
	c) -126	d) none of these	
39.	$f(x) = (x + 1)^3 (x - 3)^3$ is increasing in		[1]
	a) $(1,\infty)$	b) (-1, 3)	
	c) $(-\infty,1)$	d) $(3,\infty)$	
40.	$f(x) = \csc x \text{ in } (-\pi, 0) \text{ has a maxima at}$		[1]
	a) $x=rac{-\pi}{2}$	b) x = 0	
	c) $x=rac{-\pi}{3}$	d) $x = rac{-\pi}{4}$	
41.	In the interval (1, 2), function $f(x) = 2 x - 1 + 3 x - 2$	2 is	[1]
	a) not monotonic	b) constant	
	c) monotonically increasing	d) monotonically decreasing	
42.	The radius of the base of a cone is increasing at the radius	ate of 3 cm/minute and the altitude is decreasing at the rate	[1]
	of 4 cm/minute. The rate of change of lateral surface	when the radius = 7cm and altitude 24 cm is	
	a) $7\pi { m cm}^2/{ m min}$	b) $54\pi \mathrm{cm}^2/\mathrm{min}$	
	c) none of these	d) $27 \mathrm{cm}^2 \mathrm{/min}$	

43. The function $f(x) = 2\log (x - 2) - x^2 + 4x + 1$ increases on the interval

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[1]

	a) $(1,2)\cup(3,\infty)$	b) (2 ,4)	
	c) $(-\infty,1)\cup(2,3)$	d) (1 , 3)	
44.	If f (x) = $x + \frac{1}{x}$, then		[1]
	a) relative maximum does not exist	b) relative maximum > relative minimum	
	c) relative minimum does not exist	d) relative minimum > relative maximum	
45.	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) $-\frac{1}{3}$	
46.	The maximum value of $\left(\frac{\log x}{x}\right)$ is		[1]
	a) 1	b) e	
	c) $\frac{2}{e}$	d) $\left(\frac{1}{e}\right)$	
47.	The function $f(x) = 4 \sin^3 x - 6 \sin^2 x + 12 \sin x + 100$	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 $\left[0, \frac{\pi}{2}\right]$	
48.	If $f(x) = \frac{1}{4x^2 + 2x + 1}$, then its maximum value is		[1]
	a) 1	b) $\frac{4}{3}$	
	c) $\frac{3}{4}$	d) $\frac{2}{3}$	
49.	Let $\phi(x) = f(x) + f(2a - x)$ and $f(x) > 0$ for all $x \in [0, \infty)$	$a]$ then $\phi(x)$	[1]
	a) decreases on [0, a]	b) increases on [- a , 0]	
	c) increases on [0, a]	d) decreases on [a, 2a]	
50.	$f(x) = x^x$ has a stationary point at		[1]
	a) x = 1	b) $x=\sqrt{e}$	
	c) x = e	d) $x = \frac{1}{e}$	
51.	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) $\lambda < 1$	
52.	The function $f(x) = tanx - x$		[1]
	a) always increases	b) never increases	
	c) always decreases	d) sometimes increases and sometimes decreases.	
53.	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) none of these	d) $\frac{3}{\frac{1}{a} + \frac{1}{b} + \frac{1}{c}}$	

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[1]

54.	let f(x) = tan ⁻¹ (g(x)), where g (x) is monotonically increasing for $0 < x < \frac{\pi}{2}$ then, f(x) is		
	a) none of these	b) increasing on $(0, \frac{\pi}{4})$ and decreasing on $(\frac{\pi}{4}, \frac{\pi}{2})$	
	c) increasing on $(0, \frac{\pi}{2})$	d) decreasing on $(0, \frac{\pi}{2})$	
55.	Every invertible function is		[1]
	a) not necessarily monotonic function	b) identity function	
	c) constant function	d) monotonic function	
56.	The minimum value of $x \log_e x$ is equal to		[1]
	a) e	b) $\frac{1}{e}$	
	c) 2e	d) $-\frac{1}{e}$	
57.	If the function $f(x) = 2x^2 - kx + 5$ is increasing on	(1, 2), then k lies in the interval	[1]
	a) (4 ,∞)	b) (-∞, 8)	
	c) (8, ∞)	d) (-∞, 4)	
58.	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	
59.	The function $f(x) = x^3 + 6x^2 + 15x - 12$ is		[1]
	a) Strictly increasing on R	b) Increasing in $(-\infty,2]$ and decreasing in $(2,\infty)$	
	c) None of these	d) Strictly decreasing on R	
60.	The function $f(x) = x^3 - 6x^2 + 9x + 3$ is decreasing	g for	[1]
	a) -1 < x < -3	b) x > 1	
	c) x < 1	d) x < 1 or x > 3	
61.	The function $f(x) = x^x$ decreases on the interval		[1]
	a) (0, e)	b) (0, 1)	
	c) (1/e,e)	d) (0, $\frac{1}{e}$)	
62.	let $f(x) = x^3 - 6x^2 + 15x + 3$. Then		[1]
	a) f(x) is invertible	b) $f(x) > f(x + 1)$ for all $x \in R$	
	c) $f(x) < 0$ for all $x \in R$	d) $f(x) > 0$ for all $\in R$	
63.	The minimum value of $rac{x}{\log x}, x > 1$, is		[1]
	a) none of these	b) e	
	c) – e	d) $\frac{1}{e}$	
64.	$f(x) = \frac{x}{(x^2+1)}$ is increasing in		[1]
	a) None of these	b) $(-1,\infty)$	

	c) $(-\infty,-1)\cup(1,\infty)$	d) (-1, 1)	
65.	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	
66.	The function f(x) = $\log_e \left(x^3 + \sqrt{x^6 + 1}\right)$ is of the	e following types:	[1]
	a) even and increasing	b) odd and decreasing	
	c) even and decreasing	d) odd and increasing	
67.	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	
68.	The least value of k for which $f(x) = x^2 + kx + 1$ is it	ncreasing on (1, 2), is	[1]
	a) -2	b) 2	
	c) 1	d) -1	
69.	The point on the curve $y^2 = 4x$ which is nearest to the	he point (2,1) is	[1]
	a) (1, $2\sqrt{2}$)	b) (-2, 1)	
	c) (1, -2)	d) (1, 2)	
70.	Minimum value of the function $f(x) = x^2 + x + 1$ is		[1]
	a) none of these	b) 3	
	c) $\frac{3}{4}$	d) 1	
71.	If the function $f(x) = x^2 - kx + 5$ is increasing on [2, 4], then		[1]
	a) $k\in(-\infty,2)$	b) $k\in(2,\infty)$	
	c) $k\in (4,\infty)$	d) $k\in(-\infty,4)$	
72.	The function $f(x) = \frac{x}{1+ x }$ is		[1]
	a) strictly increasing	b) strictly decreasing	
	c) none of these	d) neither increasing nor decreasing	
73.	The function f (x) = $x + \frac{4}{x}$ has		[1]
	a) a local maxima at x =2 and a local minima at x = -2	b) local minima at $x = 2$ and a local maxima at $x = -2$	
	c) No maximum and minimum	d) absolute maxima at $x = 2$ and absolute minima at $x = -2$	
74.	Let the $f : R \to R$ be defined by $f(x) = 2x + \cos x$, then $f :$		[1]
	a) is an increasing function	b) is a decreasing function	
	c) has a minimum at x = π	d) has a maximum, at x = 0	
75.	Function $f(x) = 2x^3 - 9x^2 + 12x + 29$ is monotonical	ally decreasing when	[1]

a) x > 2	b) 1 < x < 2
c) x < 2	d) x > 3