



INDIAN SCHOOL AL WADI AL KABIR

Department of Mathematics, 2024-2025

Class XII

MATHEMATICS

28.08.2024

WORKSHEET- Application of derivatives

Q.1.	Sand is pouring from a pipe at the rate of 12 cm/s. The falling sand forms a cone on the ground in such a way that the height of the cone is always one-sixth of the radius of the base. How fast is the height of the sand cone increasing when the height is 4 cm?							
	A	$\frac{1}{48\pi} \text{ cm/s}$	B	$48\pi \text{ cm/s}$	C	48 cm/s	D	$\frac{1}{48} \text{ cm/s}$
Q.2.	The turning points of the curve $x^3 - 3x$							
	A	(2, -2) and (-2, -2)	B	(1, 0), (-1, 0)	C	(0, 0), (3, 18)	D	(1, -2) (-1, 2)
Q.3.	The interval on which the function $f(x) = 2x^3 + 9x^2 + 12x - 1$ is decreasing is							
	A	$[-1, \infty)$	B	$[-2, 1]$	C	$(-\infty, -2]$	D	$[-2, -1]$
Q.4.	$f(x) = \frac{\log x}{x}$ has a maximum at $x = ?$.							
	A	1	B	$\frac{1}{e}$	C	e	D	$-e$
Q.5.	If x is real, the minimum value of $x^2 - 4x + 5$							
	A	0	B	1	C	-1	D	17
Q.6.	Which of the following functions is decreasing on R							
	A	$2x+3$	B	x^2	C	e^{-2x}	D	$\sin x$
Q.7.	The cost function of a firm is $C = 3x^2 + 2x - 3$. Then the marginal cost , when $x= 5$							
	A	32	B	82	C	75	D	2

Q.8.	If $f(x) = x^x$, then f has a stationary point at							
	A	$x = e$	B	$x = \frac{1}{e}$	C	$x = 1$	D	$x = \sqrt{e}$
Q.9.	The rate of change of volume of a sphere with respect to radius when the radius is 10cm							
	A	100π	B	10π	C	400π	D	200π
Q10.	If $f(x) = \cos 2x + 2 $, then the minimum and maximum values of the function $f(x)$							
	A	2 and 3	B	-1 and 1	C	1 and 5	D	1 and 3
Q11	Case Study Based Question: An open topped box is to be constructed by removing equal squares from each corner of a 3 metre by 8 metre rectangular sheet of aluminium and folding up the sides. i) Write the volume of the box in terms of x ii) Maximise the volume and hence find the volume of the largest box.							
Q12.	A store has been selling calculators at ₹ 350 each. A market survey indicates that a reduction in price(p) of calculator increases the number of units(x) sold. The relation between the price and quantity sold is given by the demand function $p = 450 - \frac{1}{2}x$. Based on the above information, answer the following: (i) Determine the number of units(x) that should be sold to maximise the revenue $R(x) = x P(x)$ (ii) What rebate in price of calculator should the store give to maximise the revenue?							
Q13.	A tank with rectangular base and rectangular sides, open at the top is to be constructed so that its depth is 2 m and volume is 8 m^3. If building of tank costs Rs 700 per square metres for the base and Rs 450 per square metre for sides find (i) The dimensions of the least expensive tank. (ii) The cost of the least expensive tank.							
Q14.	Find the local maxima and local minima (if any) for the function $f(x) = 2x^3 - 3x^2 - 36x + 1$ Hence find the local maximum and local minimum value.							
Q15.	Find the absolute maximum value of the function $f(x) = \sin x + \cos x, x \in [0, \pi]$.							

ANSWERS

1.	A	2.	D	3.	D	4.	C	5.	B
6.	C	7.	A	8.	B	9.	C	10.	D
11.	(i) $(8 - 2x)(3 - 2x)x$			(ii) $\frac{200}{27}m^3$		12.	x= 450 and rebate = ₹ 225		
13.	(i) $2m \times 2m \times 2m$		(ii) ₹ 10,000		14	Local minima at x= 3 and value=-80 Local maxima at x= -2 and value= 45		15.	$\sqrt{2}$