CLASS – XII MATHEMATICS

APPLICATION OF DARIVATIVE

Q.1	Prove that the curve $xy = a^2$ and $x^2 + y^2 = 2a^2$ touch each other .
Q.2	Verify Rolle's Theorem for the function f, given by f(x)=$e^x(\sin x - \cos x)$ on $\left[\frac{\pi}{4} \quad \frac{5\pi}{4}\right]$.
Q.3	A closed cylinder has volume $2156\,cm^3$. What will be the radius of its base so that its total surface area is minimum.
Q.4	The total cost C(x) in rupees associated with the production of x units of an item is given by $C(x) = 0.007x^3 - 0.003x^2 + 15x + 4000$. Find the marginal cost when 10 units are produced.
Q.5	Find all the points at which $f(x) = (x-2)^4(x+1)^3$ has (i) local maxima (ii) local minima (iii) point of inflexion .
Q.6	An open box with a square base is to be made out of a given quantity of card board of area c^2 square units. Show that the maximum volume of the box is $\frac{c^3}{6\sqrt{3}}$ cubic units.
Q.7	Show that the curves $y^2 = 8x$ and $2x^2 + y^2 = 10$ intersects orthogonally at the point (1, $2\sqrt{2}$).
Q.8	A radio manufacturer finds that he can sell x radios per week at the price of Rs. P, where $p = 2\left(1000 - \frac{x}{4}\right)$. if the cot of production of x units per week be Rs. $\left(1200x + \frac{x^2}{2}\right)$, find the number of radios he should produce per week to maximize the profit and also find the profit he will have.
Q.9	The sum of the perimeter of a circle and a square is k, where k is some constant .prove that the sum of their areas is least when the side of square is double the radius of the circle.
Q.10	Show that the normal at any point θ to the curve x = $a\cos\theta + a\theta\sin\theta$ and $y = a\sin\theta - a\theta\cos\theta$ is at constant distance from the origin.
Q.11	The length x of a rectangle is decreasing at the rate of 2 cm / sec and the width y is increasing at the rate of 2 cm / sec . When x = 12 cm and y = 5 cm , find the rate of change of (i) the perimeter and (ii) the area of the rectangle .
Q.12	Find the maximum and minimum values of $f(x) = \sin x + \frac{1}{2}\cos 2x$ in $\left[0, \frac{\pi}{2}\right]$.
Q.13	A spherical balloon is being inflated by pumping in 16cm^3/sec of gas. At the instant when balloon contains $36\pi cm^3$ of gas, how fast is its radius increasing?
Q.14	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 m3. If building of tank costs ₹ 70 per sq meters for the base and ₹ 45

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	per square meter for sides. What is the cost of least expensive tank?
Q.15	A stone is dropped into a quiet lake and waves move in a circle at a speed of 3.5 cm /sec . At the instant when the radius of the circular wave is 7.5 cm , how fast is the enclosed area increasing ?
Q.16	If $y = 7x - x^3$ and x increases at the rate of 4 units per second , how fast is the slope of the curve changing when x = 2 ?
Q.17	If $y = x^4 - 10$ and if x changes from 2 to 1.99, what is the approximate change in y ?
Q.18	Find the maximum slope of the curve $y = -x^3 + 3x^2 + 2x - 27$.
Q.19	Find the equation of tangents to the curve $y = \cos(x + y)$, $-2\pi < x < 2\pi$ that are parallel to the line $x + 2y = 0$.
Q.20	A helicopter is flying along the curve $y = x^2 + 2$. A soldier is placed at the point (3, 2). Find the nearest distance between the soldier and the helicopter.
Q.21	For the curve $y = 4x^3 - 2x^5$, find all point at which the tangent passes through origin.
Q.22	The total cost C(x) in rupees, associated with the production and making of x units of an item is given by $C(x) = 0.005x^3 - 0.02x^2 + 30x + 5000$ Find (i) the average cost function (ii) the average cost of output of 10 units (iii) the marginal cost function (iv) the marginal cost when 3 units are produced.
Q.23	A circular metal plate expands under heating so that its radius increases by 2 %. Find the approximate increase in the area of the plate if the radius of the plate before heating is 10 cm .
Q.24	Find the equation of the normal to the curve $x^2 = 4y$ which passes through the point (1,2).
Q.25	The surface area of a spherical bubble is increasing at the rate of 2 cm^2/s. When the radius of the bubble is 6 cm , at what rate is the volume of the bubble increasing?
Q.26	Find the equations of the tangent to the curve $y = (x^3 - 1)(x - 2)$ at the points where the curve cuts the x – axis.
Q.27	Find the maximum and minimum values of $f(x) = \sin^4 x + \cos^4 x, 0 < x < \frac{\pi}{2}$.
Q.28	Sand is pouring from a pipe at the rate of 12 cm^3/ sec . 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 ?
Q.29	If $f(x) = x^3 + ax^2 + bx + c$ has a maximum at x = - 1 and minimum at x = 3 . Determine a, b. and c.
Q.30	Find a point on the parabola using LMV theorem $y = (x - 4)^2$, where the tangent is parallel to the chord joining (4,0) and (5,1).
Q.31	A particle moves along the curve $16x^2 + 9y^2 = 400$ .Find the point on curve does the ordinate decreases at the same rate at which the abscissa increases .
Q.32	Show that the maximum value of $\left(\frac{1}{x}\right)^x$ *is* $e^{1/e}$.

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Q.33	Use differentials to find the approximate value of $\tan 46^0$, if it is being given that $1^0 = 0.01745$ radians.
Q.34	Verify Rolle's theorem for functions $f(x) = \sin^2 x on 0 \le x \le \pi$.
Q.35	If the length of three sides of a trapezium, other than the base are equal to 10cm each, then find the area of trapezium when it is maximum.
Q.36	A point on the hypotenuse of a right triangle is at a distance 'a' and 'b' from the sides of the triangle. Show that the minimum length of the hypotenuse is $[a^{2/3} + b^{2/3}]^{3/2}$.
Q.37	Find all the points of local maxima and minima and the corresponding maximum and minimum values of the function $f(x) = -\frac{3}{4}x^4 - 8x^3 - \frac{45}{2}x^2 + 105$.
Q.38	Show that the surface area of a closed cuboids with square base and given volume is minimum, when it is a cube.
Q.39	Find the interval in which the function f defined by $f(x) = (x+1)^3(x-3)^3$ is increasing or decreasing.
Q.40	Find the equation of normal to the curve $y = 2x^2 + 3\sin x$ at x = 0 .
Q.41	The combined resistance R of two resistors $R_1 \& R_2 (R_1, R_2 \rangle 0)$ is given by $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ If $R_1 + R_2 = C$ (a constant) , show that the maximum resistance R is obtained by choosing $R_1 = R_2$.
Q.42	Find the point on the curve $9y^2 = x^3$, where normal to the curve makes equal intercepts with axis .
Q.43	The area of an expanding rectangle is increasing at the rate of 48cm^2/sec. the length of the rectangle is always equal to square of breadth. At what rate, the length is increasing at the instant when breadth is 4.5cm?
Q.44	Prove that the area of right –angled triangle of given hypotenuse is maximum, when the triangle is isosceles.
Q.45	A wire of length 36m is to be cut into two pieces. One of the pieces is to be made into a square and the other into a circle . What should be the lengths of the two pieces, so that the combined area of the square and the circle is minimum ?
Q.46	Show that the semi- vertical angle of a right circular cone of given surface area and maximum volume is $\sin^{-1}\left(\frac{1}{3}\right)$.
Q.47	The total cost of producing x radio sets per day is Rs$\left(\frac{x^2}{4} + 35x + 25\right)$and the price per set at which they may be sold is Rs$\left(50 - \frac{x}{2}\right)$.Find the daily output to maximize the total profit.
Q.48	Show that a cylinder of a given volume which is open at the top , has minimum total surface area, its height is equal to the radius of its base.
Q.49	Find the intervals in which the function f given by $f(x) = \sin x + \cos x, 0 \le x \le 2\pi$ is increasing or decreasing.
Q.50	A particle is moving in a straight line such that its distance s at any time t is given by

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	$S=\frac{t^4}{4}-2t^3+4t^2-7$. Find when its acceleration minimum.
Q.51	A circular disc of radius 3 cm is being heated. Due to expansion, its radius increases at the rate of 0.05 cm/s. Find the rate at which its area is increasing when radius is 3.2 cm.
Q.52	A square piece of tin of side 24cm is to be made into a box without top by cutting a square from each corner and folding up the flaps to form a box .What should be the side of the square to be cut off so that the volume of the box is maximum? Also find this maximum volume .
Q.53	Show that a cylinder of a given volume which is open at the top , has minimum total surface area, its height is equal to the radius of its base.
Q.54	Determine the values of x for which the function $f(x)=x^2-6x+9$ is increasing or decreasing. Also, find the coordinates of the point on the curve $y=x^2-6x+9$ where the normal is parallel to the line $y=x+5$.
Q.55	Find the least value of a such that the function f given by $f(x)=x^2+ax+1$ is strictly increasing on (1,2).
Q.56	A ladder 5 m long is leaning against a wall. The bottom of the ladder is pulled along the ground away from the wall, at the rate of 2 m /sec . How fast its height on the wall decreasing when the foot of the ladder is 4 m away from the wall ? How far is the foot from the wall when it and the top are moving at the same rate ?
Q.57	Show that the volume of the largest cone that can be inscribed in a sphere of radius R is 8 /27 of the volume of the sphere.
Q.58	An open tank with a square base and vertical sides is to be constructed from a metal sheet so as to hold a given quantity of water. Show that the cost of the material will be least when depth of the tank is half of its width.
Q.59	Show that the line $\frac{x}{a}+\frac{y}{b}=1$ touches the curve $y=be^{-x/a}$ at the point where it crosses the y – axis.
Q.60	Prove that a conical tent of given capacity will require the least amount of canvas when the height is $\sqrt{2}$ times the radius of the base.
Q.61	The fuel charges for running a train are proportional to the square of the speed generated in miles per hour and costs Rs 48 per hour at 16 miles per hour . What is the most economical speed if the fixed charges i.e. salaries etc . amount to Rs 300 per hour.
Q.62	A rectangle is inscribed in a semi-circle of radius 'a' with one of its sides on the diameter of semi-circle. Find the dimensions of the rectangle so that its area is maximum. Find the area also.
Q.63	A wire of length 36m is to be cut into two pieces. One of the pieces is to be made into a square and the other into a equilateral triangles . What should be the lengths of the two pieces, so that the combined area of the square and the equilateral triangles is minimum ?
Q.64	The volume of cube is increasing at the rate of 9 cubic cm gas per sec . How fast is the surface area increasing , when the length of edge is 10 cm .
Q.65	Find the coordinates of a point on the parabola $y=x^2+7x+2$ which is closest to the

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	straight line $y=3x-3$.
Q.66	The volume of a cube is increasing at a rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of an edge is 10 centimeters ?
Q.67	It is given that for the function f given by $f(x)=x^3+bx^2+ax, x\in[1,3]$ Rolle's theorem holds with $c=2+\frac{1}{\sqrt{3}}$. Find the values of a and b.
Q.68	For the curve $y=4x^3-2x^5$, find all point at which the tangent passes through origin.
Q.69	The demand function for a commodity is $p=20-\frac{x}{4}$ where p is the price per unit when x units are sold. Find the level of output at which maximum revenue is obtained. Also find the value of maximum revenue.
Q.70	Water is dripping out from a conical funnel, at a uniform rate of 2cm^3/sec through a tiny hole at the vertex at the bottom, when the slant height of the water is 4cm , find the rate of decrease of the slant height of the water, given that the vertical angle of funnel is 120^0.
Q.71	A cylinder of greatest volume is inscribed in a cone, show that (i) $R=\frac{2}{3}h\tan\alpha$ (ii) $H=\frac{1}{3}h$ (iii) Volume of the cylinder $=\frac{4}{27}\pi h^3\tan^2\alpha$. (iv) r : R = 3 : 2. Where r, h, α are the radius, height and semi – vertical angle of the cone and R, H are the radius and height of the inscribed cylinder.
Q.72	Find the intervals in which the function $f(x)=\sin\left(2x+\frac{\pi}{4}\right), 0\le x\le 2\pi$ is (i) increasing (ii) decreasing .
Q.73	The slope of tangent to curve $y=\frac{x-1}{x-2}$ at $x=10$.
Q.74	Show that $\sin^p\theta\cos^q\theta$ attains a maximum ,when $\theta=\tan^{-1}\sqrt{\frac{p}{q}}$.
Q.75	Using Lagrange's mean value theorem , find a point on the curve $y=\sqrt{x-2}$ defined on the interval [2, 3] , where the tangent is parallel to the chord joining the end points of the curve .
Q.76	Find the point on the curve $y^2=4x$ whish is nearest to the point (2,-8).
Q.77	A figure consists of a semi- circle with a rectangle on its diameter. Given the perimeter of the figure, find its dimensions in order that the area may be maximum.
Q.78	Find the equations of the tangent and the normal to the curve $y(x-2)(x-3)-x+7=0$ at the point, where it cuts x – axis .
Q.79	Find the intervals in which $f(x)=-\frac{3}{4}x^4-8x^3-\frac{45}{2}x^2+105$ is increasing or decreasing.
Q.80	Show that the curves $4x=y^2$ & $4xy=k$ cut at right angles, if $k^2=512$.
Q.81	A balloon, which always remains spherical on inflation, is being inflated by pumping in 900 cubic centimeters of gas per second. Find the rate at which the radius of the balloon increases when the radius is 15 cm.
Q.82	A particle moves along the curve $6y=x^3+2$. Find the points on the curve at which the y-coordinate is changing 8 times as fast as the x-coordinate.

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Q.83	Prove that the function f given by $f(x)$ = log sin x is strictly increasing $\left(0,\frac{\pi}{2}\right)$ and decreasing on $\left(\frac{\pi}{2},\pi\right)$.
Q.84	A man 2 metres high , Walks at a uniform speed of 6 metres per minute away from a lamp post , 5 metres high. Find the rate at which the length of his shadow increases .
Q.85	Water is dripping out from a conical funnel of semi vertical angle $\pi/4$ at the uniform rate of 2 sq.cm /sec in its surface area through a tiny hole at the vertices in the bottom. When the slant height of the water is 4 cm , find the rate of decrease of the slant height of the water .
Q.86	Find the approximate change in the volume V of a cube of side x meters caused by increasing the side by 2%.
Q.87	Find the equation of the normal to the curve $y = x^3 + 2x + 6$ which are parallel to the line $x + 14y + 4 = 0$.
Q.88	The two equal sides of an isosceles triangle with fixed base b are decreasing at the rate of 3 cm/ sec . How fast is the area decreasing when the two equal sides are equal to the base?
Q.89	Find the intervals in which the function $f(x) = 2\log(x-2) - x^2 + 4x + 1$ is increasing or decreasing.
Q.90	Use differentials to find the approximate value of $\sin 32^0$, if it is being given that $1^0 = 0.01745$ radians.
Q.91	The sum of the surface areas of a sphere and a cube is given. Show that when the sum of their volumes is least, the diameter of the sphere is equal to the edge of the cube.
Q.92	An air force plane is ascending vertically at the rate of 100 km/ h. If the radius of the earth is r km, how fast is the area of the earth , visible from the plane , increasing at 3 minutes after it started ascending ? Given that the visible area A at height h is given by $A = \frac{2\pi r^2 h}{r+h}$.
Q.93	Using differentials, find the approximate value of each of the following up to 3 places of decimal.(i) $(.999)^{1/10}$ (ii) $(32.15)^{1/5}$ (iii) $\sqrt{.037}$.
Q.94	Use differentials to find the approximate value of $\log_e(4.01)$, having given that $\log_e 4 = 1.3863$.
Q.95	A given quantity of metal is to be cast into a half cylinder with a rectangular base and semi- circular ends. Show that in order that the total surface area may be minimum , the ratio of the length of the cylinder to the diameter of its semi-circular ends is $\pi:(\pi+2)$.
Q.96	Find the approximate value of $f(5.001)$, where $f(x) = x^3 - 7x^2 + 15$.
Q.97	If $y = \frac{ax-b}{(x-1)(x-4)}$ has a turning point P(2,-1) find the values of a and b and show that y is maximum at P.
Q.98	Find the points on the curve $y = x^3 - 2x^2 - x$ at which the tangent lines are parallel to the line $y = 3x - 2$.

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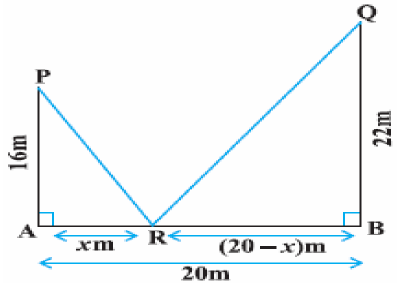
Q.99	The volume of a cube is increasing at a rate of 7 cm ^{3}/ sec . How fast is the surface area increasing when the length of an edge is 12 cm ?
Q.100	A balloon, which always remains spherical , has a variable diameter $\frac{3}{2}(2x+3)$ Determine the rate of change of volume with respect to x .
Q.101	A rectangular sheet of tin 45 cm by 24 cm is to be made into a box without top, by cutting off squares from each corners and folding up the flaps. What should be the side of the square to be cut off so that the volume of the boxes is maximum possible?
Q.102	Find the point on the curve $y^2 = 8x$ for which the abscissa and ordinate change at the same rate.
Q.103	Find local maximum and local minimum values of the function f given by $f(x) = 3x^4 + 4x^3 - 12x^2 + 12$.
Q.104	*Verify Rolle's theorem for the function* $f(x) = x^2 - 5x + 6$ *on the interval[2,3].*
Q.105	A window is in the form of a rectangle surmounted by a Equilateral triangle . The total perimeter of the window is 40m, find the dimensions of the window to admit maximum light through the whole opening.
Q.106	Use differentials to find the approximate value of $\sqrt{0.5}$.
Q.107	Find the volume of the largest cylinder that can be inscribed in a sphere of radius r cm.
Q.108	If the radius of a sphere is measured as 7 m with an error of 0.02 m, then find the approximate error in calculating its volume.
Q.109	Show that the height of a cylinder , which is open at the top having a given surface and greatest volume, is equal to the radius of its base.
	Let AP and BQ be two vertical poles at points A and B, respectively. If AP = 16 m, BQ = 22 m and AB = 20 m, then find the distance of a point R on AB from the point A such that $RP^2 + RQ^2$  G.
Q.110	A stone is dropped into a quiet lake and waves move in a circle at a speed of 3.5 cm /sec . At the instant when the radius of the circular wave is 7.5 cm , how fast is the enclosed area increasing ?
Q.111	A water tank has the shape of an inverted right circular cone with its axis vertical and vertex lower most .Its semi vertical angle is $\tan^{-1}(1/2)$. Water is poured into it at a constant rate of 5 cubic meter per minute .Find the rate at which the level of the water is rising at the instant when the depth of the water in the tank is 10 cm .
Q.112	A helicopter is flying along the curve $y = x^2 + 2$. A soldier is placed at the point (3, 2). Find the nearest distance between the soldier and the helicopter.
Q.113	The top of a ladder 6 meters long is resting against a vertical wall on a level

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	pavement, when the ladder begins to slide outwards. At the moment when the foot of the ladder is 4 meters from the wall, it is sliding away from the wall at the rate of 0.5 m / sec . How fast is the top – sliding downwards at this instance? How far is the foot from the wall when it and the top are moving at the same rate?
Q.114	Prove that the radius of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half of that of the cone.
Q.115	Find all the local maximum values and local minimum values of the function $f(x) = \sin 2x - x, -\frac{\pi}{2} < x < \frac{\pi}{2}$.
Q.116	The surface area of a spherical bubble is increasing at the rate of 2 cm^2/s. When the radius of the bubble is 6 cm , at what rate is the volume of the bubble increasing?
Q.117	Find the slope of the normal to the curve $x = a\cos^3\theta, y = a\sin^3\theta at\, \theta = \frac{\pi}{4}$.
Q.118	Show that $f(x) = \tan^{-1}(\sin x + \cos x)$ is an increasing function on the interval $(0, \pi/4)$.
Q.119	Determine the intervals in which the function f given by $f(x) = \log(1+x) - \frac{x}{1+x}, x \neq -1$ Is increasing or decreasing.
Q.120	The slope of the curve $2y^2 = ax^2 + b\ at (1,-1)$ is -1. Find a and b .
Q.121	Find the points on the curve $x^2 + y^2 - 2x - 3 = 0$ at which the tangents are parallel to the x axis.
Q.122	If the sum of the length of the hypotenuse and a side of a right angled triangle is given , show that the area of the triangle is maximum when the angle between them is $\pi/3$.
Q.123	Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$. Also find the maximum volume.
Q.124	Water is dripping out from a conical funnel of semi vertical angle $\pi/4$ at the uniform rate of 2 sq. cm /sec in its surface area through a tiny hole at the vertices in the bottom. When the slant height of the water is 4 cm , find the rate of decrease of the slant height of the water .
Q.125	The sum of the surface areas of a rectangular parallelepiped with side x, 2x and $\frac{x}{3}$ and a sphere gives to the constant. Prove that the sum of their volume is minimum if x is equal to three times the radius of sphere. Find the minimum value of the sum of the volumes.
Q.126	Of all the closed cylindrical cans (right circular), of a given volume of 100 cubic centimetres, find the dimensions of the can which has the minimum surface area?
Q.127	Water is running into a conical vessel ,15 cm deep and 5 cm in radius , at the rate of 0.1 cm^3 / sec . When the water is 6cm deep, find at what rate is (i) the water level rising ? (ii) the water – surface area increasing ? (iii) the wetted surface of the vessel increasing ?
Q.128	Prove that the least perimeter of an isosceles triangle in which a circle of radius r can be inscribed is $6r\sqrt{3}$.

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Q.129	Find the approximate value of f(2.01) where $f(x)=4x^2+5x+2$.
Q.130	Show that a cylinder of a given volume which is open at the top , has minimum total surface area, its height is equal to the radius of its base.
Q.131	Show that the semi- vertical angle of a cone of maximum volume and given slant height is $\tan^{-1}\sqrt{2}$.
Q.132	Using differential find the approximate value of $\left(\frac{17}{81}\right)^{1/4}$.
Q.133	Find the interval in which $f(x)=\frac{4\sin x-2x-x\cos x}{2+\cos x}$ on $(0,2\pi)$ is (i) increasing (ii) decreasing .
Q.134	Prove that the area of right –angled triangle of given hypotenuse is maximum, when the triangle is isosceles.
Q.135	Verify Rolle's Theorem for the function $f(x)=(x-a)^m.(x-b)^n, m,n$ being positive integers, on [a, b].
Q.136	If $y=7x-x^3$ and x increases at the rate of 4 units per second , how fast is the slope of the curve changing when x = 2 ?
Q.137	Find the angle between two curves $4x=y^2$ & $4y=x^2$.
Q.138	Find an angle θ, which increases twice as fast as its sine .
Q.139	Prove without derivative test function $f(x)=x^2$ neither increasing nor decreasing on R .
Q.140	Find the area of the greatest isosceles triangle that can be inscribed in a given ellipse having its vertex coinciding with one extremity of major axis.
Q.141	At what point on the curve $y^2=2x-1$ does the ordinate decrease as the same rate as the abscissa increase ?
Q.142	Find the intervals in which the function f defined by $f(x)=-2x^3-9x^2-12x+1$ is (i) strictly increasing (ii) strictly decreasing
Q.143	A square tank of capacity 250 cubic metres has to be dug out. The cost of the land is ₹ 50 per sq meter. The cost of digging increases with the depth and for the whole tank it is ₹ 400h^2, where h meters is the depth of the tank. What should be the dimension of the tank so that the cost be minimum?
Q.144	Prove that the greatest triangle which can be inscribed in a circle is equilateral .
Q.145	A right circular cylinder is to be inscribed in a given sphere of radius R, if the total surface area of the cylinder, including the two ends is to be maximum, prove that $h^2=2R^2(1-\frac{1}{\sqrt{5}})$.
Q.146	Find a , for which f (x) = a (x + sinx) is increasing .
Q.147	Use differentials to find the approximate value of $\sqrt{0.0037}$.
Q.148	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. Find the volume of the largest such box.
Q.149	Prove that the height and the radius of the base of an open cylinder of given surface area and maximum volume are equal.

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Q.150	Find the shortest distance of the point $(0,c)$ from the parabola $y = x^2$, where $0 \le c \le 5$.
Q.151	A rectangular sheet of paper for a poster is 15000 sq. cm. in area. The margins at the top and bottom are to be 6 cm. wide and at the sides 4 cm. wide. Find the dimensions of the sheet to maximize the printed area.
Q.152	Find the intervals in which the function f defined by $f(x) = x^3 - 6x^2 + 9x + 15$ is (i) strictly increasing (ii) strictly decreasing
Q.153	Verify Rolle's theorem for the function $f(x) = (x-1)(x-2)^2 in[1,2]$
Q.154	Find the slope of the tangent to the curve $x = a\cos^3\theta, y = a\sin^3\theta at \theta = \frac{\pi}{4}$.
Q.155	Verify Rolle's theorem for the function $f(x) = x^3 - 7x^2 + 16x - 12$ in the interval [2,3].
Q.156	Find the intervals in which the function $f(x) = \frac{4x^2+1}{x} (x \ne 0)$ is (i) increasing (ii) decreasing
Q.157	Find points at which the tangent to the curve $y = x^3 - 3x^2 - 9x + 5$ is parallel to the x-axis.
Q.158	Find a point on the parabola $f(x) = (x-3)^2$, where the tangent is parallel to the chord joining the Points (3,0) and (4,1).
Q.159	A particle moves along the curve $6y = x^3 + 2.$ find the points on the curve at which the y-coordinate is changing 8 times as fast as x-coordinate.
Q.160	Determine the intervals in which the function f given by $f(x) = \sin x - \cos x, 0 \le x \le 2\pi$ is increasing or decreasing.
Q.161	The cost function of a firm is given by $C = 4x^2 - x + 70$ find the marginal cost, when x=3.
Q.162	The radius of a spherical soap bubble is increasing at the rate of 0.2cm/sec. find the rate of increase of its surface area when radius is 4cm.
Q.163	An edge of a variable cube is increasing at the rate of 5cm/sec. how fast is the volume of cube increasing when edge is 10cm long?
Q.164	The total revenue received from the sale of x units of a product is given by $R(x) = 6x^2 + 13x + 10.$ find the marginal revenue when x=10.
Q.165	What will be the height of a variable cone when its volume and radius are changing at the rate of 100cm^3/sec and 20cm/sec respectively, and its radius is always 5 times of its height?
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