

CLASS XII

MATHS

APPLICATION OF DERIVATIVES

DERIVATIVE AS A RATE MEASURE

1. Find the rate of change of the area of a circle with respect to its radius r when $r=6\text{cm}$.
2. A stone is dropped into a quite lake & the waves in circles .If the radius of a circular wave increases at the rate of 4cm/sec ,find the rate of increase in its area at the instant when its radius is 10 cm .
3. A spherical soap bubble is expanding so that its radius is increasing at the rate of 0.02cm/sec .At what rate is the surface area increasing when its radius is 5 cm ?
4. The volume of a spherical balloon is increasing at the rate of $20\text{cm}^3/\text{sec}$. Find the rate of change of its surface area at the instant when its radius is 8cm .
5. The surface area of a spherical balloon is increasing at $2\text{cm}^2/\text{sec}$.At what rate is the volume of the bubble increasing when the radius of the bubble is 6 cm ?
6. The volume of a cube is increasing at the rate of $7\text{cm}^3/\text{sec}$.How fast is its surface area increasing at the instant when the length of an edge of the cube is 12 cm ?
7. The length x of a rectangle is decreasing at the rate of 5cm/min . When $x=8\text{cm}$ & $y=6\text{ cm}$, find the rate of change of (i) the perimeter &(ii) the area of the rectangle.
8. Water is leaking from a conical funnel at the rate of $5\text{ cm}^3/\text{sec}$.If the radius of the base of the funnel is 5 cm & its altitude is 10 cm ,find the rate at which the water level is dropping when it is 2.5 cm from the top.
9. Sand is pouring from a pipe at the rate of $12\text{cm}^3/\text{sec}$. The falling sand forms a cone on the ground in such a way that the height of the cone is always $1/6^{\text{th}}$ of the radius of the base. How fast is the height of the sand cone increasing, when the height is 4cm ?

10. A 5 m long ladder 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 is its height on the wall decreasing when the foot of the ladder is 4 m away from the wall?

11. The two equal sides of an isosceles triangle with fixed base b cm are decreasing at the rate of 3 cm/sec. How fast is the area decreasing when each of the equal sides is equal to the base?

12. A point source of light along a straight road is at a height of a metres. A man of height b is walking along the road. How fast is his shadow increasing if he is walking away from the light at the rate of c meters per minute?

13. A man 160 cm tall, walks away from a source of light situated at the top of a pole 6 m high, at the rate of 1.1 m/s. How fast is the length of his shadow increasing when he is 1 m away from the pole?

14. 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.

15. Find the points on the curve $y^2 = 8x$ for which the abscissa & ordinate change at the same rate.

16. At what points of the ellipse $16x^2 + 9y^2 = 400$ does the ordinate decrease at the same rate at which the abscissa increases?

17. The total cost $C(x)$ of producing x items in a firm is given by $C(x) = 0.005x^3 - 0.02x^2 + 30x + 6000$.

18. The total revenue received from the sale of x units of a product is given by $R(x) = 3x^2 + 40x + 10$. Find marginal revenue when $x = 5$.

ANSWERS

1. $(12\pi) \text{ cm}^2 / \text{cm}$
2. $(80\pi) \text{ cm}^2 / \text{sec}$
3. $(2.152) \text{ cm}^2 / \text{s}$
4. $5 \text{ cm}^2 / \text{sec}$
5. $6 \text{ cm}^3 / \text{sec}$
6. $2\frac{1}{3} \text{ cm}^2 / \text{sec}$
7. $2 \text{ cm}^2 / \text{min}$
8. $-\frac{16}{45\pi} \text{ cm} / \text{sec}$
9. $\frac{1}{48\pi} \text{ cm} / \text{sec}$
10. $(8/3) \text{ m} / \text{sec}$
11. $\sqrt{3} b$
12. $\frac{bc}{(a-b)} \text{ m} / \text{min}$
13. $0.4 \text{ m} / \text{sec}$
14. $(4, 11)$ and $(-4, -31/3)$
15. $(2, 4)$
16. $(3, 16/3)$ & $(-3, -16/3)$
17. Rs. 30.08
18. Rs. 70

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