

Class XII, Mathematics

Chapter 6-Application of Derivatives

(RATE MEASURE, ERROR AND APPROXIMATION)

BASIC WORKSHEET

Choose the correct answer:-

1. The point on the curve $y^2 = 8x$ for which the abscissa and ordinate change at the same rate.

- (A) (2, 4) (B) (2, 6) (C) (-2, -4) (D) (4, 4)

2. If the area of a circle increases at a uniform rate, then the perimeter varies w.r.t the radius as

- (A) inversely (B) directly (C) neither directly nor inversely (D) none of these

3. The radius of a circle is increasing at the rate of 0.7 cm/s. Then the rate of increase of its circumference

- (A) 2.54π cm/s (B) 2.40π cm/s (C) 4.1π cm/s (D) 1.4π cm/s

4. The total revenue in rupees received from the sale of x units of a product is given by

$R(x) = 3x^2 + 6x + 5$. The marginal revenue, when $x = 5$ in rupees is

- (A) 30 (B) 36 (C) 42 (D) 110

5. The sides of an equilateral triangle are increasing at the rate of 2 cm/s. The rate at which the area increases, when the side is 10 cm.

- (A) $30\text{cm}^2/\text{s}$ (B) $10\sqrt{3}\text{cm}^2/\text{s}$ (C) $30\sqrt{3}\text{cm}^2/\text{s}$ (D) $36\text{cm}^2/\text{s}$

6. If $f(x) = 3x^2 + 15x + 5$, then the approximate value of $f(3.02)$ by using differentials is

- (A) 77.66 (B) 66.77 (C) 70.66 (D) 67.76

7. The approximate change in the volume V of a cube of side x cm caused by increasing the side by 2% is

- (A) $0.06x^3\text{cm}^3$ (B) $0.16x^3\text{cm}^3$ (C) $1.06x^3\text{cm}^3$ (D) $0.60x^3\text{cm}^3$

8. The height of the cone increases by $k\%$, its semi-vertical angle remain same. The approximate percentage increase in total surface area is

- (A) k^2 (B) $2k^2$ (C) $3k^2$ (D) $4k^2$

9. The approximate change in the surface area of a cube of side x m caused by decreasing the side by 1% is

- (A) $-0.12x^2\text{m}^2$ (B) $-0.24x^2\text{m}^2$ (C) $-0.22x^2\text{m}^2$ (D) $-1.02x^2\text{m}^2$

10. The approximate value of $\sqrt{0.24}$ is
 (A) 0.12 (B) 0.49 (C) 0.049 (D) 4.9
11. The rate of change of surface area of a sphere whose radius is 7 cm is
 (A) 176 cm (B) 176π cm (C) 167 cm (D) 716 cm.
12. If the sides of an equilateral triangle is increasing at the rate of $\frac{1}{3}$ cm/sec then the rate of increase of its perimeter is
 (A) 1 cm/sec (B) 2 cm/sec (C) 3 cm/sec (D) none of these
13. If $r = 5$ cm, then the rate of change of area of a circle with respect its radius r is
 (A) 20π cm²/cm (B) π cm²/cm (C) 25π cm²/cm (D) 10π cm²/cm
14. An angle x , which increases twice as fast as its sine is
 (A) $\pi/2$ (B) $\pi/3$ (C) $\pi/4$ (D) $\pi/6$
15. If there is an error of 0.1% in the measurement of radius of sphere then the approximate % of error in volume of sphere is
 (A) 0.3% (B) 0.03% (C) 0.35% (D) 3%

Fill in the blanks:-

16. The rate of change of the area of a square of side x cm, when sides vary is -----.
17. The rate of change of surface area of a cylinder of radius r and height h , when radius varies is -----.
18. The rate of change of volume of a sphere with respect to its diameter D is -----.
19. A balloon, which always spherical, has a variable diameter $\frac{3}{2}(5x + 6)$. The rate of change of volume with respect to x is -----.
20. The rate of change of radius of a circle is increasing at 0.7 cm/s. The rate of change of increase of its circumference is -----.

Answer the following questions

21. Find the rate of change of the volume of a sphere with respect to its surface area, when the radius is 2 cm.
22. Find the rate of change of the area of a circular disc with respect to its circumference, when the radius is 3 cm.
23. At what points of the ellipse $16x^2 + 9y^2 = 400$, does the ordinate decrease at the same rate at which the abscissa increases.

24. 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 the marginal cost when 3 units are produced.

25. A particle is moving in a vertical line, when equation of motion is given by

$S = 32 + 46t - 4.9t^2$, s is measured in metres and t is measured in seconds. Find the velocity and acceleration of the particle at $t = 3s$.

26. A man is walking at the rate of 6.5 km/hr towards the foot of a tower 120 m high. At what rate is he approaching the foot of the tower when he is 50 metres from the tower ?

27. A kite is 120 metre high and 130 metre string is out. If kite is moving away horizontally at the rate of 52 m/s. Find the rate at which the string is being out.

28. The side of a square sheet is increasing at the rate of 4 cm/min. At what rate its area is increasing, when side is 8 cm long ?

29. An edge of a variable cube is increasing at the rate of 3 cm/s. How fast is the volume the cube increasing when the edge is 10 cm ?

30. A particle moves along the curve $y = \frac{2}{3}x^3 + 1$. Find the points on the curve at which the y -coordinate is changing twice as fast as x -coordinate.