SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth **Subject :Maths**
Date : **DPP No. :1**

Topic :-Application of Derivatives

1. The maximum value of the function $f(x)$ given by $f(x) = x(x-1)^2, 0 < x < 2$, is

a) 0 b) 4/27 c) -4 d) 1/4

2. For a given integer k, in the interval $\left[2\pi k + \frac{\pi}{2}, 2\pi k - \frac{\pi}{2}\right]$ the graph of $sin\ sin\ x$ is

a) Increasing from -1 to 1
b) Decreasing from -1 to 0
c) Decreasing from 0 to 1
d) None of the above

3. If θ is the semi vertical angle of a cone of maximum volume and given slant height, then $tan\ tan\ \theta$ is given by

a) 2 b) 1 c) $\sqrt{2}$ d) $\sqrt{3}$

4. The value of b for which the function $f(x) = sin\ sin\ x - bx + c$ is decreasing in the interval $(-\infty, \infty)$ is given by

a) $b < 1$ b) $b \geq 1$ c) $b > 1$ d) $b \leq 1$

5. The function $f(x) = 2x^3 + 3x^2 - 12x + 1$ decreases in the interval

a) (2, 3) b) (1, 2) c) (-2, 1) d) (-3, -2)

6. If $f(x) = 2\ x + x + log\ log\ \left(\sqrt{1+x^2} - x\right)$, then $f(x)$

a) Increases on R
b) Decreases in $[0, \infty)$
c) Neither increases nor decreases in $(0, \infty)$
d) None of these

7. The maximum value of $f(x) = 3x\ + 4x\ + cos\ cos\ \frac{x}{2}\ + sin\ sin\ \frac{x}{2}$, is

a) 4 b) $3 + \sqrt{2}$ c) $4 + \sqrt{2}$ d) $2 + \sqrt{2}$

8. If $a^2x^4 + b^2y^4 = c^6$, then maximum value of xy is

a) $\frac{c^2}{\sqrt{ab}}$

b) $\frac{c^3}{ab}$

c) $\frac{c^3}{\sqrt{2ab}}$

d) $\frac{c^3}{2ab}$

9. A stone is dropped into a quiet lake. If the waves moves in circles at the rate of 30cm/sec when the radius is 50 m, the rate of increase of enclosed area is

a) $30\,\pi\, m^2/sec$ b) $30\, m^2/sec$ c) $3\pi\, m^2/sec$ d) None of these

10. The equation of the tangent to the curve $x = t\, cos\, cos\, t$, $y = t\, sin\, sin\, t$ at the origin is

a) $x = 0$ b) $y = 0$ c) $x + y = 0$ d) $x - y = 0$

11. The rate of change of the surface area of a sphere of a sphere of radius$r$,when the radius is increasing at the rate of 2 $cm/s$is proportional to

a) $\frac{1}{r}$ b) $\frac{1}{r^2}$ c) r d) r^2

12. The maximum value of $(1/x)^x$, is

a) e b) e^e c) $e^{1/e}$ d) $(1/e)^{1/e}$

13. If $f(x) = 2x^3 - 21x^2 + 36x - 30$, then which one of the following is correct

a) $f(x) has\ minimum\ at\ x = 1$ b) $f(x) has\ maximum\ at\ x = 6$

c) $f(x) has\ maximum\ at\ x = 1$ d) $f(x) has\ maxima\ or\ minima$

14. An edge of a variable cube is increasing at the rate of 10cm/s. How fast the volume of the cube will increase when the edge is 5 cm long?

a) 750 cm $\frac{3}{s}$ b) 75 cm $\frac{3}{s}$ c) 300 cm$\frac{3}{s}$ d) 150 $cm\frac{3}{s}$

15. The tangents to the curve $x = a(\theta - sin\, sin\, \theta)$, $y = a(1 + cos\, cos\, \theta)$ at the points $\theta = (2k+1)\pi, k \in Z$ are parallel to:

a) $y = x$ b) $y = -x$ c) $y = 0$ d) $x = 0$

16. The normal to the curve $5x^5 - 10x^3 + x + 2y + 6 = 0$ at $P(0, -3)$ meets the curve again at the point

a) $(-1, 1), (1, 5)$ b) $(1, -1), (-1, -5)$ c) $(-1, -5), (-1, 1)$ d) $(-1, 5), (1, -1)$

17. The normal to the curve represented parametrically by $x = a(cos\, cos\, \theta + \theta\, sin\, sin\, \theta)$ and $y = a(sin\, sin\, \theta - \theta\, cos\, cos\, \theta)$ at any point θ, is such that it

a) Makes a constant angle with x-axis

b) Is at a constant distance from the origin

c) Passes through the origin

d) Satisfies all the three conditions

18. If $f(x) = \{3x^2 + 12\, x - 1, -1 \le x \le 2\ 37 - x,\ \ 2 < x \le 3$, then

a) $f(x)$ is increasing in $[-1, 2]$

b) $f(x)$ is continuous in $[-1, 3]$

c) $f(x)$ is maximum at $x = 2$

d) All the above

19. The value of c, in the Lagrange's Mean value theorem $\frac{f(b)-f(a)}{b-a} = f'(c)$, for the function $f(x) = x(x-1)(x-2)$ in the interval $[0, 1/2]$, is

a) $\frac{1}{4}$ b) $1 - \frac{\sqrt{21}}{6}$ c) $\frac{9}{8}$ d) $1 + \frac{\sqrt{21}}{6}$

20. If $f(x) = kx - sin\, sin\, x$ is monotonically increasing, then

a)	$k > 1$	b)	$k > -1$	c)	$k < 1$	d)	$k < -1$

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth **Subject :Maths**
Date : **DPP No. :2**

Topic :-Application of Derivatives

1. In the mean value theorem $\frac{f(b)-f(a)}{b-a} = f'(c)$, if $a = 0, b = \frac{1}{2}$ and $f(x) = x(x-1)(x-2)$, then value of c is

a) $1 - \frac{\sqrt{15}}{6}$ **b)** $1 + \sqrt{15}$ **c)** $1 - \frac{\sqrt{21}}{6}$ **d)** $1 + \sqrt{21}$

2. If $f(x) = \frac{1}{4x^2+2x+1}$, then its maximum value is

a) 4/3 **b)** 2/3 **c)** 1 **d)** 3/4

3. The diameter of a circle is increasing at the rate of 1cm/sec. When its radius is π, the rate of increase of its area is

a) $\pi\ cm^2/sec$ **b)** $2\pi\ cm^2/sec$ **c)** $\pi^2\ cm^2/sec$ **d)** $2\pi^2\ cm^2/$

4. The minimum value of $2x + 3y$, when $xy = 6$, is

a) 9 **b)** 12 **c)** 8 **d)** 6

5. The equation of the normal to the curve $y^4 = ax^3$ at (a, a) is

a) $x + 2y = 3a$ **b)** $3x - 4y + a = 0$ **c)** $4x + 3y = 7a$ **d)** $4x - 3y = 0$

6. The value of c in Rolle's theorem when

$f(x) = 2x^3 - 5x^2 - 4x + 3, x \in [1/3,3]$, is

a) 2 **b)** $-1/3$ **c)** -2 **d)** $2/3$

7. Suppose the cubic $x^3 - px + q$ has three distinct real roots where $p > 0$ and $q > 0$. Then,

which one of the following holds?

a) The cubic has maxima at both $\frac{p}{3}$ and $-\frac{p}{3}$ **b)** The cubic has minima at $\frac{p}{3}$ $and\ maxima\ at$ $-\frac{p}{3}$

c) The cubic has minima at $-\frac{p}{3}$ $and\ maxima\ at$ $\frac{p}{3}$ **d)** The cubic has minima at both $\frac{p}{3}$ and $-\frac{p}{3}$

8. The chord joining the points where $x = p$ and $x = q$ on the curve $y = ax^2 + bx + c$ is

parallel to the tangent at the point on the curve whose abscissa is

a) $\frac{p+q}{2}$ **b)** $\frac{p-q}{2}$ **c)** $\frac{pq}{2}$ **d)** None of these

9. n is a positive integer. If the value of c prescribed in Rolle's theorem for the function

$f(x) = 2x(x-3)^n$ on the interval $[0, 3]$ is $3/4$, then the value of n is

a) 5 b) 2 c) 3 d) 4

10. The shortest distance between the line $y - x = 1$ and the curve $x = y^2$ is

a) $\frac{3\sqrt{2}}{8}$ b) $\frac{2\sqrt{3}}{8}$ c) $\frac{3\sqrt{2}}{5}$ d) $\frac{\sqrt{3}}{4}$

11. If the distance s covered by a particle in time t is proportional to the cube root of its velocity, then the acceleration is

a) A constant b) $\propto s^3$ c) $\propto \frac{1}{s^3}$ d) $\propto s^5$

12. The distance travelled $s(in\ meteres)$ by a particle in t second is given by, $s = t^3 + 2t^2 + t$.The speed of the particle after 18 will be

a) 8 cm/s b) 6 cm/s c) 2 cm/s d) None of these

13. Using differentials, the approximate value of $(627)^{1/4}$ is

a) 5.002 b) 5.003 c) 5.005 d) 5.004

14. The length of the subtangent at any point (x_1, y_1)on the curve $y = a^x, (a > 0)$ is

a) $2 \log \log a$ b) $\frac{1}{\log \log a}$ c) $\log \log a$ d) $a^{2x_1} \log \log a$

15. Using differentials the approximate value of $\sqrt{401}$ is

a) 20.100 b) 20.025 c) 20.030 d) 20.125

16. A ladder 10 m long rests against a vertical wall with the lower end on the horizontal ground. The lower end of the ladder is pulled along the ground away from the wall at the rate of 3 cm/s. The height of the upper end while it is descending at the rate of 4cm/s, is

a) $4\sqrt{3}$m b) $5\sqrt{3}$m c) 6m d) 8m

17. A cubic $f(x)$ vanishes at $x = -2$ and has relative minimum/maximum at $x = -1$ and $x = \frac{1}{3}$ such that $\int_{-1}^{1} f(x)dx = \frac{14}{3}$. Then, $f(x)$ is

a) $x^3 + x^2 - x$ b) $x^3 + x^2 - x + 1$ c) $x^3 + x^2 - x + 2$ d) $x^3 + x^2 - x - 2$

18. The different between the greatest and least values of the function $f(x) = \cos \cos x \frac{1}{2} \cos \cos 2x - \frac{1}{3} \cos \cos 3x$ is

a) $\frac{2}{3}$ b) $\frac{8}{7}$ c) $\frac{3}{8}$ d) $\frac{9}{4}$

19. The number of real roots of the equation $e^{x-1} + x - 2 = 0$

a) 1 b) 2 c) 3 d) 4

20. If $f(x) = x\ + x$, then which one of the following is false?

a) $f(x) \le 1$ b) $f(x) \le 2$ c) $f(x) > \frac{1}{4}$ d) $f(x) \le \frac{1}{8}$

SESSION : 2025-26

DPP

DAILY PRACTICE PROBLEMS

Class : XIth **Subject :Maths**

Date : **DPP No. :3**

Topic :-Application of Derivatives

1. The set $\{x^3 - 12x: -3 \leq x \leq 3\}$ is equal to

a) $\{x: -16 \leq x \leq 16\}$ b) $\{x: -12 \leq x \leq 12\}$ c) $\{x: -9 \leq x \leq 9\}$ d) $\{x: 0 \leq x \leq 10\}$

2. If $xy = a^2$ and $S = b^2x + c^2y$ where a, b and c are constants, then the minimum value of S is

a) abc b) $\sqrt{a}\,bc$ c) $2abc$ d) None of these

3. Let $g(x) = f(x) + f'(1-x)$ and $f''(x) < 0, 0 \leq x \leq 1$. Then

a) $g(x)$ increases on $[1/2, 1]$ and decreases on $[0, 1/2]$

b) $g(x)$ decreases on $[0,1]$

c) $g(x)$ increases on $[0,1]$

d) $g(x)$ increases on $[0, 1/2]$ and decreases on $[1/2, 1]$

4. Select the correct statement from (a), (b), (c), (d) The function $f(x) = xe^{1-x}$

a) Strictly increasing in the interval $\left(\frac{1}{2}, 2\right)$ b) Increasing in the interval $(0, \infty)$

c) Decreases in the interval $(0, 2)$ d) Strictly decreasing in the interval $(1, \infty)$

5. If $\frac{a_0}{n+1} + \frac{a_1}{n} + \frac{a_2}{n-1} + \cdots + \frac{a_{n-1}}{2} + a_n = 0$. Then the function $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \cdots + a_n$ has in $(0, 1)$

a) At least one zero b) At most one zero c) Only 3 zeros d) Only 2 zeros

6. A particle is moving along the curve $x = at^2 + bt + c$. If $ac = h^2$, then the particle would be

moving with uniform

a) Rotation　b) Velocity　c) Acceleration　d) Retardation

7. The approximate value of $(33)^{1/5}$ is

a) 2.0125　b) 2.1　c) 2.01　d) None of these

8. At an instant the diagonal of a square is increasing at the rate of $0.2 cm/sec$ and the area is increasing at the rate of $6 cm^2/sec$. At that moment its side is

a) $\frac{30}{\sqrt{2}} cm$　b) $30\sqrt{2}\ cm$　c) 30 cm　d) 15 cm

9. A missile is fired from the ground level rises x metres vertically upwards in t seconds where $x = 100t - \frac{25}{2}t^2$.The maximum height reached is

a) 200 m　b) 125 m　c) 160 m　d) 190 m

10. The intercepts made by the tangent to the curve $y = \int_0^x |t| dt$, which is parallel to the line $y = 2x$, on y-axis are equal to

a) $1, -1$　b) $-2, 2$　c) 3　d) -3

11. The function $f(x) = tan\ tan\ x - x$

a) Always increases

b) Always decreases

c) Never decreases

d) Some times increases and some times decreases

12. The maximum value of xy subject to $x + y = 8$, is

a) 8　b) 16　c) 20　d) 24

13. The tangent to the curve $y = 2x^2 - x + 1$ is parallel to the line $y = 3x + 9$ at the point

a) (3, 9)　b) (2, -1)　c) (2, 1)　d) (1, 2)

14. The point P of the curve $y^2 = 2x^3$ such that the tangent at P is perpendicular to the line $4x - 3y + 2 = 0$ is given by

a) (2, 4) b) $(1, \sqrt{2})$ c) $(1/2, -1/2)$ d) $(1/8, -1/16)$

15. If the parametric equation of a curve given by $x = e^t\, cost, y = e^t\, sin\, sin\, t$, then the tangent to the

curve at the point $t = \pi/4$ makes with axis of x the angle

a) 0 b) $\pi/4$ c) $\pi/3$ d) $\pi/2$

16. All points on the curve $y^2 = 4a\left(x + a\, sin\, sin\, \frac{x}{a}\right)$ at which the tangents are parallel to the axis of x

lie on a

a) Circle b) Parabola c) Line d) None of these

17. The point of inflexion for the curve $y = x^{5/2}$ is

a) (1, 1) b) (0, 0) c) (1, 0) d) (0, 1)

18. The minimum value of $2x + 3y$, when $xy = 6$, is

a) 12 b) 9 c) 8 d) 6

19. If $(x) = x^2 - 2x + 4$ on [1, 5], then the value of a constant c such that $\frac{f(5)-f(1)}{5-1} = f'(c)$, is

a) 0 b) 1 c) 2 d) 3

20. Let a, b be two distinct roots of a polynomial $f(x)$. Then there exists at least one root lying between a and b of the polynomial

a) $f(x)$ b) $f'(x)$ c) $f"(x)$ d) None of these

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth **Subject :Maths**
Date : **DPP No. :4**

Topic :-Application of Derivatives

1. The set $\{x^3 - 12x: -3 \leq x \leq 3\}$ is equal to

a) $\{x: -16 \leq x \leq 16\}$ b) $\{x: -12 \leq x \leq 12\}$ c) $\{x: -9 \leq x \leq 9\}$ d) $\{x: 0 \leq x \leq 10\}$

2. If $xy = a^2$ and $S = b^2x + c^2y$ where a, b and c are constants, then the minimum value of S is

a) abc b) $\sqrt{a}\, bc$ c) $2abc$ d) None of these

3. Let $g(x) = f(x) + f'(1-x)$ and $f''(x) < 0, 0 \leq x \leq 1$. Then

a) $g(x)$ increases on $[1/2,1]$ and decreases on $[0,1/2]$
b) $g(x)$ decreases on $[0,1]$
c) $g(x)$ increases on $[0,1]$
d) $g(x)$ increases on $[0,1/2]$ and decreases on $[1/2,1]$

4. Select the correct statement from (a), (b), (c), (d) The function $f(x) = xe^{1-x}$

a) Strictly increasing in the interval $\left(\frac{1}{2}, 2\right)$ b) Increasing in the interval $(0, \infty)$
c) Decreases in the interval $(0, 2)$ d) Strictly decreasing in the interval $(1, \infty)$

5. If $\frac{a_0}{n+1} + \frac{a_1}{n} + \frac{a_2}{n-1} + \cdots + \frac{a_{n-1}}{2} + a_n = 0$. Then the function $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \cdots + a_n$ has in $(0, 1)$

a) At least one zero b) At most one zero c) Only 3 zeros d) Only 2 zeros

6. A particle is moving along the curve $x = at^2 + bt + c$. If $ac = h^2$, then the particle would be moving with uniform

a) Rotation b) Velocity c) Acceleration d) Retardation

7. The approximate value of $(33)^{1/5}$ is

a) 2.0125 b) 2.1 c) 2.01 d) None of these

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a) $\frac{30}{\sqrt{2}}$ cm b) $30\sqrt{2}$ cm c) 30 cm d) 15 cm

9. A missile is fired from the ground level rises x metres vertically upwards in t seconds where $x = 100t - \frac{25}{2}t^2$.The maximum height reached is

a) 200 m b) 125 m c) 160 m d) 190 m

10. The intercepts made by the tangent to the curve $y = \int_0^x |t|\, dt$, which is parallel to the line $y = 2x$, on y-axis are equal to

a) $1, -1$ b) $-2, 2$ c) 3 d) -3

11. The function $f(x) = \tan x - x$

a) Always increases
b) Always decreases
c) Never decreases
d) Some times increases and some times decreases

12. The maximum value of xy subject to $x + y = 8$, is

a) 8 b) 16 c) 20 d) 24

13. The tangent to the curve $y = 2x^2 - x + 1$ is parallel to the line $y = 3x + 9$ at the point

a) (3, 9) b) (2, -1) c) (2, 1) d) (1, 2)

14. The point P of the curve $y^2 = 2x^3$ such that the tangent at P is perpendicular to the line $4x - 3y + 2 = 0$ is given by

a) $(2, 4)$ b) $(1, \sqrt{2})$ c) $(1/2, -1/2)$ d) $(1/8, -1/16)$

15. If the parametric equation of a curve given by $x = e^t \cos t, y = e^t \sin t$, then the tangent to the curve at the point $t = \pi/4$ makes with axis of x the angle

a) 0 b) $\pi/4$ c) $\pi/3$ d) $\pi/2$

16. All points on the curve $y^2 = 4a\left(x + a \sin\frac{x}{a}\right)$ at which the tangents are parallel to the axis of x lie on a

a) Circle b) Parabola c) Line d) None of these

17. The point of inflexion for the curve $y = x^{5/2}$ is

a) (1, 1) b) (0, 0) c) (1, 0) d) (0, 1)

18. The minimum value of $2x + 3y$, when $xy = 6$, is

a) 12 b) 9 c) 8 d) 6

19. If $(x) = x^2 - 2x + 4$ on $[1, 5]$, then the value of a constant c such that $\frac{f(5)-f(1)}{5-1} = f'(c)$, is

a) 0 b) 1 c) 2 d) 3

20. Let a, b be two distinct roots of a polynomial $f(x)$. Then there exists at least one root lying between a and b of the polynomial

a) $f(x)$ b) $f'(x)$ c) $f''(x)$ d) None of these

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth **Subject :Maths**
Date : **DPP No. :5**

Topic :-Application of Derivatives

1. A population $p(t)$ of 1000 bacteria introduced into nutrient medium grows according to the relation$p(t) = 1000 + \frac{1000t}{100+t^2}$. The maximum size of this bacterial population is

a) 1100 b) 1250 c) 1050 d) 5250

2. If $f'(x) = (x-a)^{2n}(x-b)^{2m+1}$ where $m, n \in N$, then

a) $x = b$ is a point of minimum
b) $x = b$ is a point of maximum
c) $x = b$ is a point of inflexion
d) None of these

3. A point is moving on$y = 4 - 2x^2$. The x —coordinate of the point is decreasing at the rate of 5 unit per second. Then, the rate at which y-coordinate of the point is changing when the point is at (1,2)is

a) 5 units b) 10 units c) 15 units d) 20 units

4. The point of the curve $y^2 = 2(x-3)$ at which the normal is parallel to line $y - 2x + 1$=0

a) $(5, 2)$ b) $\left(-\frac{1}{2}, -2\right)$ c) $(5, -2)$ d) $\left(\frac{3}{2}, 2\right)$

5. The function $f(x) = \frac{x}{1+|x|}$ is

a) Strictly increasing
b) Strictly decreasing
c) Neither increasing nor decreasing
d) Not differential at $x = 0$

6. The function $f(x) = 2x^3 - 3x^2 + 90x + 174$ is increasing in the interval

a) $\frac{1}{2} < x < 1$
b) $\frac{1}{2} < x < 2$
c) $3 < x < \frac{59}{4}$
d) $-\infty < x < \infty$

7. Let $f(x) = \begin{cases} |x|, & for\ 0 < |x| \leq 2 \\ 1, & for\ \ x = 0 \end{cases}$, then at $x = 0, f$ has

a) A local maximum
b) A local minimum
c) No local extremum
d) No local maximum

8. The set of values of a for which the function $f(x) = x^2 + ax + 1$ is an increasing function on $[1, 2]$ is

a) $(-2, \infty)$
b) $[-4, \infty)$
c) $[-\infty, -2)$
d) $(-\infty, 2]$

9. A particle moves along the curve$y = x^2 + 2x$. Then, The point on the curve such that x and y coordinates of the particle change with the same rate is

a) (1,3)
b) $\left(\frac{1}{2}, \frac{5}{2}\right)$
c) $\left(-\frac{1}{2}, -\frac{3}{4}\right)$
d) $(-1, -1)$

10. Given $P(x) = x^4 + ax^3 + bx^2 + cx + d$ such that $x = 0$ is the only real root of $P'(x) = 0. If\ P(-1) < P(1)$,then in the interval$[-1,1]$

a) $P(-1)$ is the minimum and $P(1)$is the maximum of P.
b) $P(-1)$ is not minimum but $P(1)$is the maximum of P.
c) $P(-1)$ is the minimum and $P(1)$is not the maximum of P.
d) Neither $P(-1)$ is the minimum nor $P(1)$is not the maximum of P.

11. If the equation $a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x = 0$ has a positive root α, then the equation

$n\, a_n x^{n-1} + (n-1)a_{n-1}x^{n-2} + \cdots + a_1 = 0$ has

a) A positive root less than α
b) A positive root larger than α
c) A negative root
d) No positive root

12. If the error committed in measuring the radius of the circle is 0.05%, then the corresponding error in calculating the area is

a) 0.05% b) 0.0025% c) 0.25% d) 0.1%

13. The edge of a cube is equal to the radius of the sphere. If the rate at which the volume of the cube is increasing is equal to λ, then the rate of increase of volume of the sphere is

a) $\frac{4\pi\lambda}{3}$ b) $4\pi\lambda$ c) $\frac{\lambda}{3}$ d) None of these

14. Tangent is drawn to ellipse $\frac{x^2}{27}+y^2=1$ at $(3\sqrt{3}\cos\theta, \sin\theta)$ (where$\theta \in (0, \pi/2)$). Then the value of θ such that sum of intercepts on axes made by this tangent is minimum, is

a) $\pi/3$ b) $\pi/6$ c) $\pi/8$ d) $\pi/4$

15. Roll's theorem is not applicable to the function $f(x)=|x|$ for $-2 \le x \le 2$ because

a) f is continuous for $-2 \le x \le 2$
b) f is not derivable for $x=0$
c) $f(-2)=f(2)$
d) f is not a constant function

16. The abscissa of the point on the curve

$y=a(e^{x/a}+e^{-x/a})$
Where the tangent is parallel to the x-axis, is

a) 0 b) a c) $2a$ d) $-2a$

17. The value of a in order that $f(x)=\sin x-\cos x-ax+b$ decreases for all real values of x is given by

a) $a \ge \sqrt{2}$ b) $a < \sqrt{2}$ c) $a \ge 1$ d) $a < 1$

18. Let $f(x)=1+2x^2+2^2x^4+\ldots\ldots+2^{10}x^{20}$.Then, $f(x)$ has

a) More than one minimum
b) Exactly one minimum
c) At least one maximum
d) None of the above

19. If the subnormal at any point on $y=a^{1-n}x^n$ is of constant length, then the value of n, is

a) 1 b) 1/2 c) 2 d) -2

20. The normal to the curve $x=a(1+\cos\theta), y=a\sin\theta$ at θ always passes through the fixed point

a) $(a,0)$ b) $(0,a)$ c) $(0,0)$ d) (a,a)

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DPP
DAILY PRACTICE PROBLEMS

Class : XIth **Subject :Maths**
Date : **DPP No. :6**

Topic :-Application of Derivatives

1. If tangent to the curve $x = at^2, y = 2at$ is perpendicular to x-axis, then its point of contact is

a) (a, a) b) $(0, a)$ c) $(0, 0)$ d) $(a, 0)$

2. If $y = 4x - 5$ is tangent to the curve $y^2 = px^3 + q$ at $(2, 3)$ then (p, q) is

a) $(2, 7)$ b) $(-2, 7)$ c) $(-2, -7)$ d) $(2, -7)$

3. A particle is moving in a straight line. At time t, the distance between the particle from its starting point is given by $x = t - 6t^2 + t^3$. Its acceleration will be zero at

a) $t = 1$ unit time b) $t = 2$ units time c) $t = 3$ units time d) $t = 4$ units time

4. If $y = 4x - 5$ is a tangent to the curve $y^2 = px^3 + q$ at $(2, 3)$, then

a) $p = 2, q = -7$ b) $p = -2, q = 7$ c) $p = -2, q = -7$ d) $p = 2, q = 7$

5. Let the function $g: (-\infty, \infty) \to \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ be given by $g(u) = 2\tan^{-1}(e^u) - \frac{\pi}{2}$. Then, g is

a) Even and is strictly increasing in $(0, \infty)$
b) Odd and is strictly decreasing in $(-\infty, \infty)$
c) Odd and is strictly increasing in $(-\infty, \infty)$
d) Neither even nor odd, but is strictly increasing in $(-\infty, \infty)$

6. The tangent to the curve $y = 2x^2 - x + 1$ at a point P is parallel to $y = 3x + 4$, then the coordinates of P are

a) $(2, 1)$ b) $(1, 2)$ c) $(-1, 2)$ d) $(2, -1)$

7. Let a, b, c be positive real numbers and $ax^2 + b/x^2 \geq 2$ for all $x \in R^+$. Then,

a) $4ab \geq c^2$ b) $4ac \geq b^2$ c) $4bc \geq a^2$ d) $4ac < b^2$

8. The function $f(x) = x^4 - 62\,x^2 + ax + 9$ attains its maximum value on the interval [0, 2] at $x = 1$. Then, the value of a is

a) 120 b) -120 c) 52 d) 60

9. The point on the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$, the normal at which is parallel to the x-axis, is

a) $(0, 0)$ b) $(0, a)$ c) $(a, 0)$ d) (a, a)

10. The equation of the tangent to curve $y(2x-1)e^{2(1-x)}$ at the points its maximum, is

a) $y - 1 = 0$ b) $x - 1 = 0$ c) $x + y - 1 = 0$ d) $x - y + 1 = 0$

11. If for a function $f(x), f'(a) = 0, f''(a) = 0, f'''(a) > 0$, then at $x = a, f(x)$ is

a) Minimum b) Maximum c) Not an extreme point d) Extreme point

12. The function $f(x) = x + \sin x$ has

a) A minimum but no maximum b) A maximum but no minimum
c) Neither maximum nor minimum d) Both maximum and minimum

13. Gas is being pumped into a spherical balloon at the rate of $30ft^3$/min.Then, the rate at which the radius increases when it reaches the value 15ft is

a) $\frac{1}{15\pi}$ft/min b) $\frac{1}{30\pi}$ft/min c) $\frac{1}{20}$ft/min d) $\frac{1}{25}$ft/min

14. The equation of tangent to the curve $\frac{x^2}{3} - \frac{y^2}{2} = 1$, which is parallel to $y = x$, is

a) $y = x \pm 1$ b) $y = x - 1/2$ c) $y = x + 1/2$ d) $y = 1 - x$

15. If the curves $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and $\frac{x^2}{l^2} - \frac{y^2}{m^2} = 1$ cut each other orthogonally, then

a) $a^2 + b^2 = l^2 + m^2$ b) $a^2 - b^2 = l^2 - m^2$ c) $a^2 - b^2 = l^2 + m^2$ d) $a^2 + b^2 = l^2 - m^2$

16. A point moves along the curve $12y = x^3$ in such a way that the rate of increase of its ordinate is more than the rate of increase of abscissa. The abscissa of the point lies in the interval

a) $(-2, 2)$ b) $(-\infty, -2) \cup (2, \infty)$ c) $[-2, 2]$ d) None of these

17. The smallest circle with centre on y-axis and passing through the point(7,3)has radius

a) $\sqrt{58}$ b) 7 c) 3 d) 4

18. The point in the interval $[0, 2\pi]$, where $f(x) = e^x \sin x$ has maximum slope, is

a) $\frac{\pi}{4}$ b) $\frac{\pi}{2}$ c) π d) $\frac{3\pi}{2}$

19. The perimeter of a sector is p. The area of the sector is maximum, when its radius is

a) $\sqrt{p}$ b) $\frac{1}{\sqrt{p}}$ c) $\frac{p}{2}$ d) $\frac{p}{4}$

20. The normal at point (1,1) of the curve $y^2 = x^3$ is parallel to the line

a) $3x - y - 2 = 0$ b) $2x + 3y - 7 = 0$ c) $2x - 3y + 1 = 0$ d) $2y - 3x + 1 = 0$

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth **Subject :Maths**
Date : **DPP No. :7**

Topic :-Application of Derivatives

1. A particle moves in a straight line so that $s=\sqrt{t}$, then its acceleration is proportional to
a) $(\text{velocity})^3$ b) velocity c) $(\text{velocity})^2$ d) $(\text{velocity})^{3/2}$

2. If PQ and PR are the two sides of a triangle, then the angle between them which gives maximum area of the triangle, is
a) π b) $\pi/3$ c) $\pi/4$ d) $\pi/2$

3. The function $f(x)=a\cos x+b\tan x+x$ has extreme values at $x=0$ and $x=\frac{\pi}{6}$, then
a) $a=-\frac{2}{3}, b=-1$ b) $a=\frac{2}{3}, b=-1$ c) $a=-\frac{2}{3}, b=1$ d) $a=\frac{2}{3}, b=1$

4. The distance between the origin and the normal to the curve $y=e^{2x}+x^2$ at $x=0$ is
a) 2 b) $\frac{2}{\sqrt{3}}$ c) $\frac{2}{\sqrt{5}}$ d) $\frac{1}{2}$

5. The function $f(x)=x\,e^{1-x}$ strictly
a) Increases in the interval $(0,\infty)$
b) Decreases in the interval $(0,2)$
c) Increases in the interval $(1/2, 2)$
d) Decreases in the interval $(1,\infty)$

6. If f and g are two decreasing functions such that gof exists, then gof, is
a) An increasing function
b) A decreasing function
c) Neither increasing nor decreasing
d) None of these

7. The length of subnormal of parabola $y^2=4ax$ at any point is equal to
a) $\sqrt{2}a$ b) $2\sqrt{2}a$ c) $\frac{a}{\sqrt{2}}$ d) $2a$

8. If tangent to the curve $x=at^2, y=2at$ is perpandicular to x-axis, then its point of contact is
a) (a,a) b) $(0,a)$ c) $(0,0)$ d) $(a,0)$

9. The abscissa of the point on the curve $ay^2 = x^3$, the normal at which cuts off equal intercepts from the coordinate axes is
a) $2\ a/9$ b) $4\ a/9$ c) $-4\ a/9$ d) $-2\ a/9$

10. The point on the curve $y = 2x^2 - 6x - 4$ at which the tangent is parallel to the x-axis, is
a) $\left(\frac{3}{2}, \frac{13}{2}\right)$ b) $\left(-\frac{5}{2}, -\frac{17}{2}\right)$ c) $\left(\frac{3}{2}, \frac{17}{2}\right)$ d) $\left(\frac{3}{2}, -\frac{17}{2}\right)$

11. If the function $f(x) = x^3 - 6x^2 + ax + b$ satisfies Rolle's theorem in the interval $[1, 3]$ and $f'\left(\frac{2\sqrt{3}+1}{\sqrt{3}}\right) = 0$, then
a) $a = -11$ b) $a = -6$ c) $a = 6$ d) $a = 11$

12. Let $g(x) = \begin{cases} 2e & if\ x \leq 1 \\ \log(x-1), & if\ \ x > 1 \end{cases}$. The equation of the normal to y=$g(x)$at the point (3,log 2), is
a) $y - 2x = 6 + \log 2$ b) $y + 2x = 6 + \log 2$ c) $y + 2x = 6 - \log 2$ d) $y + 2x = -6 + \log 2$

13. If f is an increasing function and g is a decreasing function on an interval I such that fog exists, then
a) fog is an increasing function on I
b) fog is a decreasing function on I
c) fog is neither increasing nor decreasing on I
d) None of these

14. N characters of information are held on magnetic tape, in batches of x characters each, the batch processing time is $\alpha + \beta x^2$ seconds, α and β are constants. The optical value of x for fast processing is,
a) α/β b) β/α c) $\sqrt{\alpha/\beta}$ d) $\sqrt{\beta/\alpha}$

15. The longest distance of the point $(a, 0)$ from the curve $2x^2 + y^2 - 2\ x = 0$, is given by
a) $\sqrt{1 - 2\ a + a^2}$ b) $\sqrt{1 + 2\ a + 2a^2}$ c) $\sqrt{1 + 2\ a - a^2}$ d) $\sqrt{1 - 2\ a + 2\ a^2}$

16. The coordinates of the point on the curve $y = x^2 - 3x + 2$ where the tangent is perpendicular to the straight line $y = x\ are$
a) (0.2) b) (1.0) c) (−1,6) d) (2,−2)

17. The tangent and normal at the point $P(at^2, 2\ at)$ to the parabola $y^2 = 4\ ax$ meet the x-axis in T and G respectively, then the angle at which the tangent at P to the parabola is inclined to the tangent at P to the circle through T, P, G is
a) $\tan^{-1} t^2$ b) $\cot^{-1} t^2$ c) $\tan^{-1} t$ d) $\cot^{-1} t$

18. The normal to the curve $x = a(\cos\theta + \theta\sin\theta), y = a(\sin\theta - \theta\cos\theta)$ at any point θ is such that

a) It is at a constant distance from the origin
b) It passes through $\left(\frac{a\pi}{2}, -a\right)$
c) It makes angle $\frac{\pi}{2} - \theta$ with the x-axis
d) It passes through the origin

19. If $f(x) = xe^{x(1-x)}$, then $f(x)$ is

a) Increasing on $\left[-\frac{1}{2}, 1\right]$
b) Decreasing on R
c) Increasing on R
d) Decreasing on $\left[-\frac{1}{2}, 1\right]$

20. The function $f(x) = 2x^3 - 15x^2 + 36x + 4$ is maximum at

a) $x = 2$
b) $x = 4$
c) $x = 0$
d) $x = 3$

SESSION : 2025-26

DPP
DAILY PRACTICE PRODUCTS

Class : XIth | **Subject :Maths**
Date : | **DPP No. :8**

Topic :-Application of Derivatives

1. A particle moves on the parabola $y^2 = 4ax$ in such a way that its projection on the y-axis has a constant velocity. Then its projection on x-axis moves with
   a) Constant velocity
   b) Constant acceleration
   c) Variable velocity
   d) Variable acceleration

2. The points of extremum of the function $\phi(x) = \int_1^x e^{-t^2/2}(1-t^2)dt$, are
   a) $x = 0, 1$
   b) $x = 1, -1$
   c) $x = 1/2$
   d) $x = -1/2$

3. A stone is thrown vertically upwards and the height x ft reached by the stone in t seconds is given by $x = 80t - 16t^2$. The stone reaches the maximum height in
   a) 2s
   b) 2.5s
   c) 3s
   d) 1.5s

4. If $ax^2 + bx + 4$ attains its minimum value -1 at $x = 1$, then the values of $a$and b are respectively
   a) $5, -10$
   b) $5, -5$
   c) $5, 5$
   d) $10, -5$

5. The function $f(x) = \log(1+x) - \frac{2x}{2+x}$ is increasing on
   a) $(0, \infty)$
   b) $(-\infty, 0)$
   c) $(-\infty, \infty)$
   d) None of these

6. Let $f(x) = e^x \sin x$, slope of the curve $y = f(x)$ is maximum at $x = a$, if 'a' equals
   a) 0
   b) $\pi/4$
   c) $\pi/2$
   d) None of these

7. The slope of the tangent to the curve $y = \sqrt{9 - x^2}$ at the point where ordinate and abscissa are equal, is
   a) 1
   b) -1
   c) 0
   d) None of these

8. If $0 < x < \frac{\pi}{2}$, then
   a) $\cos(\sin x) > \cos x$
   b) $\cos(\sin x) < \cos x$
   c) $\cos(\sin x) = \sin(\cos x)$
   d) $\cos(\sin x) < \sin(\cos x)$

9. In the mean value theorem $f(b) - f(a) = (b - a)f'(c)$, if $a = 4, b = 9$ and $f(x) = \sqrt{x}$, then the value of c is

a) 8.00 b) 5.25 c) 4.00 d) 6.25

10. If the function $f(x) = (2a - 3)(x + 2\sin 3) + (a - 1)(\sin^4 x + \cos^4 x) + \log 2$ does not possess critical points, then

a) $a \in (-\infty, 4/3) \cup (2, \infty)$

b) $a \in (4/3, 2)$

c) $a \in (4/3, \infty)$

d) $a \in (2, \infty)$

11. If $s = ae^t + be^{-t}$ is the equation of motion of a particle, then its acceleration is equal to

a) s b) $2s$ c) $3s$ d) $4s$

12. The angle of intersection of the curves $y = x^2$ and $x = y^2$ is

a) $\tan^{-1}\left(\frac{4}{3}\right)$ b) $\tan^{-1}(1)$ c) $90°$ d) $\tan^{-1}\left(\frac{3}{4}\right)$

13. A spherical balloon is expanding. If the radius is increasing at the rate of 2 cm/min, the rate at which the volume increase (in cubic centimeters per minute)when the radius is 5 cm, is

a) 10π b) 100π c) 200π d) 50π

14. If the radius of a circle be increasing at a uniform rate of 2cm/s. The area of increasing of area of circle ,at the instant when the radius is 20 cm, is

a) $70\pi cm^2/s$ b) $70 cm^2/s$ c) $80\pi cm^2/s$ d) $80\ cm^2/s$

15. The abscissa of the points, where the tangent to curve $y = x^3 - 3x^2 - 9x + 5$ is parallel to $x-$axis , are

a) $x = 0\ and\ 0$ b) $x = 1\ and - 1$ c) $x = 1\ and\ -3$ d) $x = -1\ and\ 3$

16. If $f(x) = x^3 - 6x^2 + 9x + 3$ be a decreasing function, then x lies in

a) $(-\infty, -1) \cap (3, \infty)$ b) $(1, 3)$ c) $(3, \infty)$ d) None of these

17. If the curve $y = ax^3 + bx^2 + cx$ is inclined at 45° to x-axis at (0, 0) but touches x-axis at (1, 0), then

a) $a = 1, b = -2, c = 1$ b) $a = 1, b = 1, c = -2$ c) $a = -2, b = 1, c = 1$ d) $a = -1, b = 2, c = 1$

18. The value of x for which

$1 + x\log_e\left(x + \sqrt{x^2 + 1}\right) \geq \sqrt{x^2 + 1}\ are$

a) $x \leq 0$ b) $0 \leq x \leq 1$ c) $x \geq 0$ d) None of these

19. The function $f(x) = x^{-x}, (x \in R)$ attains a maximum, value at x which is

a) 2 b) 3 c) $\frac{1}{e}$ d) 1

20. The value of c in $(0, 2)$ satisfying the Mean value theorem for the function $f(x) = x(x-1)^2, x \in [0, 2]$ is equal to

a) $\frac{3}{4}$ b) $\frac{4}{3}$ c) $\frac{1}{3}$ d) $\frac{2}{3}$

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth **Subject :Maths**
Date : **DPP No. :9**

Topic :-Application of Derivatives

1. If the ratio of base radius and height of a cone is 1 : 2 and percentage error in radius is λ %, then the error in its volume is
a) λ % b) 2λ % c) 3 λ% d) None of these

2. The values of a in order that $f(x) = \sqrt{3}\sin x - \cos x - 2ax + b$ decreases for all real values of x, is given by
a) $a < 1$ b) $a \geq 1$ c) $a \leq \sqrt{2}$ d) $a < \sqrt{2}$

3. The function $f(x) = \cos(\pi/x)$ is increasing in the interval
a) $(2n + 1, 2n), n \in N$
b) $\left(\frac{1}{2n+1}, 2n\right), n \in N$
c) $\left(\frac{1}{2n+2}, \frac{1}{2n+1}\right), n \in N$
d) None of these

4. If the curves $\frac{x^2}{a^2} + \frac{y^2}{12} = 1$ and $y^3 = 8x$ intersect at right angle then the value of a^2 is equal to
a) 16 b) 12 c) 8 d) 4

5. Let $f(x)$ and $g(x)$ be differentiable for $0 \leq x \leq 1$, such that $f(0) = 2, g(0) = 0, f(1) = 6$. Let there exist a real number c in $[0, 1]$ such that $f'(c) = 2g'(c)$, then the value of $g(1)$ must be
a) 1 b) 2 c) -2 d) -1

6. If a differentiable function $f(x)$ has a relative minimum at $x = 0$, then the function $\phi(x) = f(x) + ax + b$ has a relative minimum at $x = 0$ for
a) All a and all b b) All b if $a = 0$ c) All $b > 0$ d) All $a > 0$

7. The point at which the tangent to the curve $y = 2x^2 - x + 1$ is parallel to $y = 3x + 9$, will be
a) (2, 1) b) (1, 2) c) (3, 9) d) $(-2, 1)$

8. The maximum slope of the curve $y = -x^3 + 3x^2 + 2x - 27$ is
a) 5 b) -5 c) 1/5 d) None of these

9. For the curve $y^n = a^{n-1}x$ if the subnormal at any point is a constant, then n is equal to

a) 1 b) 2 c) -2 d) -1

10. On which of the following intervals is the function $f(x) = 2\,x^2 - \log|x|\,, x \neq 0$ increasing?

a) $(1/2, \infty)$

b) $(-\infty, -1/2) \cup (1/2, \infty)$

c) $(-\infty, -1/2) \cup (0,1/2)$

d) $(-1/2, 0) \cup (1/2, \infty)$

11. The abscissa of the point on the curve $ay^2 - x^3$, the normal at which cuts off equal intercepts from the coordinate axes is

a) $\frac{2a}{9}$ b) $\frac{4a}{9}$ c) $-\frac{4a}{9}$ d) $-\frac{2a}{9}$

12. If $f(x) = \sin x - \cos x$, the interval in which function is decreasing in $0 \leq x \leq 2\pi$, is

a) $\left[\frac{5\pi}{6}, \frac{3\pi}{4}\right]$ b) $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$ c) $\left[\frac{3\pi}{2}, \frac{5\pi}{2}\right]$ d) None of these

13. The function $f(x) = \frac{x}{2} + \frac{2}{x}$ has local minimum at

a) $x = -2$ b) $x = 0$ c) $x = 1$ d) $x = 2$

14. The least value of the $f(x)$ given by $f(x) = \tan^{-1} x - \frac{1}{2}\log_e x$ in the interval $[1/\sqrt{3}, \sqrt{3}]$, is

a) $\frac{\pi}{6} + \frac{1}{4}\log_e 3$ b) $\frac{\pi}{3} - \frac{1}{4}\log_e 3$ c) $\frac{\pi}{6} - \frac{1}{4}\log_e 3$ d) $\frac{\pi}{3} + \frac{1}{4}\log_e 3$

15. If the line $ax + by + c = 0$ is a normal to the curve $xy = 1$, then

a) $a > 0, b > 0$ b) $a > 0, b < 0$ c) $a < 0, b < 0$ d) Data is insufficient

16. Let y be the number of people in a village at time t. Assume that the rate of change of the population is proportional to the number of people in the village at any time and further assume that the population never increase in time. Then, the population of the village at any fixed t is given by

a) $y = e^{kt} + c$, for some constants $c \leq 0$ and $k \geq 0$

b) $y = ce^{kt}$, for some constants $c \geq 0$ and $k \leq 0$

c) $y = e^{ct} + k$, for some constants $c \leq 0$ and $k \geq 0$

d) $y = k\,e^{ct}$, for some constants $c \geq 0$ and $k \leq 0$

17. The equation of the tangent to the curve $x^2 - 2xy + y^2 + 2x + y - 6 = 0$at (2,2) is

a) $2x + y - 6 = 0$ b) $2y + x - 6 = 0$ c) $x + 3y - 8 = 0$ d) $3x + y - 8 = 0$

18. The length of the normal to the curve $x = a(\theta + \sin\theta), y = a(1 - \cos\theta) at\ \theta = \frac{\pi}{2} is$

a) 2a b) $\frac{a}{2}$ c) $\frac{a}{\sqrt{2}}$ d) $\sqrt{2a}$

19. The maximum value of function $f(x) = \sin x\,(1 + \cos x), x \in R$ is

a) $\frac{3^{3/2}}{4}$ b) $\frac{3^{5/3}}{4}$ c) $\frac{3}{2}$ d) $\frac{3^{7/5}}{4}$

20. The minimum value of $2x^2 + x - 1$ is

a) $-\frac{1}{4}$ b) $\frac{3}{2}$ c) $-\frac{9}{8}$ d) $\frac{9}{8}$

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

Class : XIth **Subject :Maths**
Date : **DPP No. :10**

Topic :-Application of Derivatives

1. If $x = t^2$ and $y = 2t$, then equation of the normal at $t = 1$, is
a) $x + y - 3 = 0$ b) $x + y - 1 = 0$ c) $x + y + 1 = 0$ d) $x + y + 3 = 0$

2. The side of an equilateral triangle is $'a'$ units and is increasing at the rate of λ units/sec. The rate of increase of its area is
a) $\frac{2}{\sqrt{3}}\lambda\, a$ b) $\sqrt{3}\lambda\, a$ c) $\frac{\sqrt{3}}{2}\lambda\, a$ d) None of these

3. If a and b are positive numbers such that $a > b$, then the minimum value of a $\sec\theta - b\tan\theta \left(0 < \theta < \frac{\pi}{2}\right)$ is
a) $\frac{1}{\sqrt{a^2 - b^2}}$ b) $\frac{1}{\sqrt{a^2 + b^2}}$ c) $\sqrt{a^2 + b^2}$ d) $\sqrt{a^2 - b^2}$

4. If $y = x^n$, then the ratio of relative errors in y and x is
a) $1 : 1$ b) $2 : 1$ c) $1 : n$ d) $n : 1$

5. How many real solutions does the equation $x^7 + 14x^5 + 16x^3 + 30x - 560 = 0$ have?
a) 5 b) 7 c) 1 d) 3

6. The function $f(x) = x^3 + ax^2 + bx + c, a^2 \le 3b\ has$
a) One maximum value b) One minimum value
c) No extreme value d) One maximum and one minimum value

7. The fixed point P on the curve $y = x^2 - 4x + 5$ such that the tangent at P is perpendicular to the line $x + 2y - 7 = 0$ is given by
a) (3, 2) b) (1, 2) c) (2, 1) d) None of these

8. If the area of the triangle, included between the axes and any tangent to the curve $xy^n = a^{n+1}$ is constant, then the value of n is
a) -1 b) -2 c) 1 d) 2

9. The radius of a circular plate is increasing at the rate of 0.01 cm/s when the radius is 12 cm. Then , The rate at which the area increase, is
a) $0.24\,\pi$ sq cm/s b) $60\,\pi$ sq cm/s c) $24\,\pi$ sq cm/s d) $1.2\,\pi$ sq cm/s

10. If $g(x) = \min(x, x^2)$ where x is real number, then
a) $g(x)$ is an increasing function
b) $g(x)$ is a decreasing function
c) $g(x)$is a constant function
d) $g(x)$ is a continuous function except at $x = 0$

11. The angle between the curves $y = a^x$ and $y = b^x$ is equal to
a) $\tan^{-1}\left(\left|\frac{a-b}{1+ab}\right|\right)$ b) $\tan^{-1}\left(\left|\frac{a+b}{1-ab}\right|\right)$
c) $\tan^{-1}\left(\left|\frac{\log b+\log a}{1+\log a\log b}\right|\right)$ d) $\tan^{-1}\left(\left|\frac{\log a-\log b}{1+\log a\log b}\right|\right)$

12. The function which is neither decreasing nor increasing in $\left(\frac{\pi}{2}, \frac{3\pi}{2}\right)$, is
a) cosec x b) $\tan x$ c) x^2 d) $|x-1|$

13. On the interval [0, 1] the function $x^{25}(1-x)^{75}$ takes its maximum value at the point
a) 0 b) $\frac{1}{4}$ c) $\frac{1}{2}$ d) $\frac{1}{3}$

14. A function f is defined by $f(x) = e^x \sin x$ in$[0, \pi]$. Which of the following is not correct?
a) f is continous in $[0, \pi]$ b) f is differentiable in $[0, \pi]$
c) $f(0) = f(\pi)$ d) Rolle's theorem is not true in $[0, \pi]$

15. If $xy = c^2$, then minimum value of $ax + by$ is
a) $c\sqrt{ab}$ b) $2c\sqrt{ab}$ c) $-c\sqrt{ab}$ d) $-2c\sqrt{ab}$

16. If $x - 2y = 4$, the minimum value of xy is
a) -2 b) 0 c) 0 d) -3

17. The function $f(x) = (9 - x^2)^2$ increasing in
a) $(-3, 0) \cup (3, \infty)$ b) $(-\infty, -3) \cup (3, \infty)$ c) $(-\infty, -3) \cup (0, 3)$ d) $(-3, 3)$

18. The real number x when added to its inverse gives the minimum value of the sum at x equals to
a) 2 b) 1 c) -1 d) -2

19. The points on the curve $12y = x^3$ whose ordinate and abscissa change at the same rate, are
a) $(-2, -2/3), (2, 2/3)$ b) $(-2/3, -2), (2/3, 2)$ c) $(-2, -2/3)$ only d) $(2/3, 2)$ only

20. Let $P(2, 2)$ and $Q(1/2, -1)$ be two points on the parabola $y^2 = 2x$. The coordinates of the point R on the parabola $y^2 = 2x$, where the tangent to the curve is parallel to the chord PQ, are

a) $(2, -1)$ b) $(1/8, 1/2)$ c) $(\sqrt{2}, 1)$ d) $(-\sqrt{2}, 1)$