

**ARULMIGU PALANIANDAVAR ARTS COLLEGE
FOR WOMEN, PALANI**

DEPARTMENT OF MATHEMATICS

DIFFERENTIAL CALCULUS

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ONE MARK QUESTIONS AND ANSWERS

1. If $y = \sin 2x$, find $\frac{dy}{dx}$? (Ans : $2\cos 2x$)
2. If $y = \sin(x^2)$ then $\frac{dy}{dx} =$ _____ (Ans : $2x\cos(x^2)$)
3. If $y = e^{\sin x}$ then $\frac{dy}{dx} =$ _____ (Ans : $e^{\sin x} \cos x$)
4. If $y = \sin(\log x)$ find $\frac{dy}{dx}$? (Ans : $\frac{\cos(\log x)}{x}$)
5. If $y = \log(\sin x)$ then $\frac{dy}{dx} =$ _____ (Ans : $\cot x$)
6. If $y = \sin e^x$ then $\frac{dy}{dx} =$ _____ (Ans : $e^x \cos e^x$)
7. A function $f(x)$ is called an odd function, if $f(x) =$ _____ (Ans : $-f(x)$)
8. A function $f(x)$ is called an even function ,if $f(-x) =$ _____ (Ans : $f(x)$)
9. Find the derivative of $y = \sqrt{\sin x}$ with respect to x ? (Ans : $\frac{\cos x}{2\sqrt{\sin x}}$)
10. $\frac{d}{dx}(\sin^{-1} x) =$ _____ (Ans : $\frac{1}{\sqrt{1-x^2}}$)
11. $\frac{d}{dx}(\cos^{-1} x) =$ _____ (Ans : $\frac{-1}{\sqrt{1-x^2}}$)
12. If f is differentiable at every point of an open interval I then we say that f is _____ on I . (Ans : differentiable)
13. If f is differentiable at x then f is continuous at x (True/ false) (Ans: True)
14. $\sinh x =$ _____ (Ans : $\frac{e^x - e^{-x}}{2}$)
15. $1 - \tanh^2 x = \operatorname{sech}^2 x$ (True/ false) (Ans : True)
16. If $u(x)$ be differentiable at x and $C \in R$, then $Cu(x)$ is differentiable at x and $(cu)'(x) =$ _____ (Ans : $cu'(x)$)
17. If $y = (\sin^{-1}(2x))$ find $\frac{dy}{dx}$? (Ans : $\frac{2}{\sqrt{1-4x^2}}$)

18. If $y = (\sin^{-1}(x))^2$ then $\frac{dy}{dx} =$ _____ (Ans : $\frac{2\sin^{-1}x}{\sqrt{1-x^2}}$)
19. If $y = \sin^{-1}(e^x)$ then $\frac{dy}{dx} =$ _____ (Ans : $\frac{e^x}{\sqrt{1-e^{2x}}}$)
20. $\cosh^2 x + \sinh^2 x =$ _____ (Ans : $\cosh 2x$)
21. If $f(x) = \log\sqrt{x}$ then $f'(x) =$ _____ (Ans : $\frac{1}{2x}$)
22. If $f(x) = \log(\cos x)$ find the value of $f'(x)$? (Ans : $-\tan x$)
23. If $f(x) = \log x^2$ then $f'(x) =$ _____ (Ans : $\frac{2}{x}$)
24. Find the value of $\frac{dy}{dx}$ at (1,1) when $y = x^x$ (Ans : 1)
25. If $y = x^{2x}$ find $y_1 =$ _____ (Ans : $2x^{2x} (1+\log x)$)
26. If $x^y y^x = 1$ then $y_{1(1,1)} =$ _____ (Ans : -1)
27. Find the value of $\frac{dy}{dx}$ if $x = \cos t$, $y = \sin t$ (Ans : $-\cot t$)
28. If $x=t^2$ and $y=t^3$ then $\frac{d^2y}{dx^2} =$ _____ (Ans : $\frac{3}{4t}$)
29. If $u=x^3$ and $v=x^2$ then $\frac{du}{dv} =$ _____ (Ans : $\frac{3x}{2}$)
30. If $u=\tan^{-1}x$ and $v=\cot^{-1}x$ then $\frac{du}{dv} =$ _____ (Ans : -1)
31. In a curve $y=t^2+2t$ and $x=t^3$ find the slope $\frac{dy}{dx}$ at $t=5$? (Ans : $\frac{4}{25}$)
32. If $x = t^2-1$ and $y = t^2+t$ then $\frac{dy}{dx} =$ _____ (Ans : $1 + \frac{1}{2t}$)
33. $\frac{d}{dx}(a^x) =$ _____ (Ans : $a^x \log a$)
34. If $x^2 + y^2 = a^2$ then $\frac{dy}{dx} =$ _____ (Ans : $\frac{-x}{y}$)
35. If $2x^3 - 3y^2 = 7$ find $\frac{dy}{dx}$? (Ans : $\frac{x^2}{y}$)
36. If $y^2 = 4ax$ then $\frac{dy}{dx} =$ _____ (Ans : $\frac{2a}{y}$)
37. If $x^2 - y^2 = a^2$ then $\frac{dy}{dx} =$ _____ (Ans : $\frac{x}{y}$)

38. If $\log\{\log\{\log x\}\}=y$ find $\frac{dy}{dx}$? (Ans : $\frac{1}{x \log x (\log(\log x))}$)
39. Find the derivative of $\sin^2(2x + 5)$ w.r. to x ? (Ans : $2 \sin(4x+10)$)
40. If $y=e^{\sin x}$ then $\frac{dy}{dx} =$ _____ (Ans : $e^{\sin x} \cdot \cos x$)
41. If $y=e^{ax}$ find y_n ? (Ans : $a^n e^{ax}$)
42. The value of $\frac{d(\log \cos x)}{dx} =$ _____ (Ans : $-\tan x$)
43. If $y = 5\cos x - 3\sin x$ then $\frac{d^2y}{dx^2} + y =$ _____ (Ans : 0)
44. If $f(x) = x - \frac{1}{x}$ then $f'(-1) =$ _____ (Ans : 2)
45. Find the minimum value of function $f(x)=x^2-x+2$ is ____ (Ans : $\frac{7}{4}$)
46. If $y=x^x$, what is $\frac{dy}{dx}$ at $x=1$? (Ans : 1)
47. If $y=e^{\log(\log x)}$ find $\frac{dy}{dx}$? (Ans : $\frac{1}{x}$)
48. If $f(x)=5x^2(x+47)$ find $f''(x) =$ _____ (Ans : $30x+470$)
49. If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ is a homogeneous function of degree ____ (Ans : $\frac{1}{2}$)
50. If $u = \sqrt{x^2 - y^2} \sin^{-1}\left(\frac{x}{y}\right)$ is a homogeneous function of degree (Ans: 1)
51. A function $f(x,y)$ is said to be homogeneous of degree n , if
 $f(\lambda x, \lambda y) =$ _____ (Ans : $\lambda^n f(x, y)$)
52. Does $f(x,y)=x^3+xy^2+900$ satisfy the Euler's theorem? (True/ false)
 (Ans: false)
53. If $u=x^3-2x^2y+y^3$ is a homogeneous function of degree _____ (Ans: 3)
54. If $u = \tan^{-1}\left(\frac{y}{x}\right)$ find $xu_y - yu_x$? (Ans: 1)
55. If $u = \tan^{-1}\left(\frac{y}{x}\right)$ find $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = ?$ (Ans: 0)
56. If $p=q^2r^2$ find $\frac{\partial^2 p}{\partial q^2} \times \frac{\partial^2 p}{\partial r^2} = ?$ (Ans : $4p$)

57. If $u=ax+6y+8z$ and $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$, find a ? (Ans : -14)
58. If $u = f\left(\frac{y}{x}\right)$ find $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$? (Ans : 0)
59. Find the n^{th} differential coefficient of $\cos 4x$. (Ans : $4^n \cos\left(\frac{n\pi}{2} + 4x\right)$)
60. Find the n^{th} differential coefficient of $\sin 3x$. (Ans : $3^n \cos\left(\frac{n\pi}{2} + 3x\right)$)
61. If $x=t^2$ and $y=2t$ then the equation of the normal at $t=1$ is ____
(Ans : $x+y-3=0$)
62. Find the equation of the tangent to the curve $y=x^3$ at $(1,1)$?
(Ans : $3x-y-2=0$)
63. The equation of a curve in terms of p and r is called the ____ equation of the curve.
(Ans : Pedal / $p-r$)
64. The reciprocal of the curvature of a curve at any point is called the ____ of curvature (Ans : radius)
65. Find the radius of curvature at $x=\frac{\pi}{2}$ on the curve $y = \sin x$ is ____ (Ans : -1)
66. Curvature of a curve $y=f(x)$ is defined as ____ (Ans : $\frac{d\psi}{ds}$)
67. The radius of curvature of a curve $y= f(x)$ is defined as ____ (Ans : $\frac{ds}{d\psi}$)
68. The radius of curvature of a circle of radius r is ____ (Ans : r)
69. The curvature of a circle of diameter d is ____ (Ans : $\frac{2}{d}$)
70. The curvature of the curve $x^2 + y^2 = r^2$ is ____ (Ans : $\frac{1}{r}$)
71. The radius of curvature of the curve $x^2 + y^2 = 2ax$ is ____ (Ans : a)
72. The curvature of the straight line $y = mx+c$ is ____ (Ans : 0)
73. The radius of curvature of the straight line $ax+by+c=0$ is ____ (Ans : ∞)
74. The radius of curvature of $y= e^x$ at the point where the curve cuts the y axis is ____
(Ans : $2\sqrt{2}$)
75. The radius of curvature of $y = \sin x$ at $x = 0$ is ____ (Ans : ∞)

76. The radius of curvature of the curve $x=2\cos\theta$, $y=2\sin\theta$ at $\theta=\frac{\pi}{6}$ is____ (Ans : 2)
77. The radius of curvature of the curve $y=\cos x$ at $(0,1)$ is ____ (Ans : -1)
78. The p-r equation of the curve $r = e^\theta$ is _____ (Ans : $p = \frac{r}{\sqrt{2}}$)
79. The p-r equation of the curve $r=a\theta$ is_____ (Ans : $p^2(a^2+r^2) = r^4$)
80. The radius of curvature of the curve $y=4\sin x$ at $x=\frac{\pi}{2}$ is____ (Ans : $\frac{-1}{4}$)
81. The locus of the centres of curvature of a curve is called the _____ of The curve. (Ans : Evolute)
82. The ordinate of the centre of curvature of the curve $y=f(x)$ at (x,y) is _____ (Ans : $y + \frac{1+y_1^2}{y_2}$)
83. The ordinate of the centre of curvature of the curve $y=x^2$ at the origin is_____ (Ans : $\frac{1}{2}$)
84. The abscissa of the centre of curvature of the curve $y=x^2$ at the origin is_____ (Ans : 0)
85. The abscissa of the centre of curvature of the curve $xy=c^2$ at (c,c) is _____ (Ans : $2c$)
86. The ordinate of the centre of curvature of the curve $xy=1$ at $(1,1)$ is____ (Ans : 2)
87. The evolute of the parabola $y^2=4ax$ is_(Ans : a semi cubical parabola)
88. The evolute of the cycloid $x=a(\theta - \sin \theta)$ and $y = a(1 - \cos\theta)$ is____ (Ans : another cycloid)
89. If $x=r\cos \theta$ and $y=r\sin \theta$ then the jacobian value is_____ (Ans : r)
90. If $u = x+y$, $v = 2x-3y$ find J ? (Ans :-5)
91. If $x=r\cos \theta$ and $y=r\sin \theta$ then the value of $\frac{\partial(x,y)}{\partial(r,\theta)} \cdot \frac{\partial(r,\theta)}{\partial(x,y)} =$ ____ (Ans : 1)

92. Find the Jacobian of p, q, r w.r.to x, y, z given $p=x+y+z$; $q=y+z$; $r=z$
 is _____ (Ans : 1)
93. If x is real ,the minimum value of $x^2-8x+17$ is ____ (Ans : 1)
94. Find the minimum value of x^2-x+2 ? (Ans : $\frac{7}{4}$)
95. Find the Jacobian from the following transformation $x+y=u, y=uv$?
 (Ans : u)
96. Find the Jacobian from the following transformation $u=2x+3y,$
 $v= x-2y$? (Ans : -7)
97. Find the Jacobian from the following transformation $u= x+y, v=x-y$?
 (Ans : -2)
98. The local maximum value of the function $f(x)=3x^4+4x^3-12x^2+12$ is at
 $x =$ _____ (Ans : 0)
99. The maximum value of the function $f(x)= x^3+2x^2 -4x+6$ exists at____
 (Ans : -2)
100. It is given that at $x=2$,the function $x^3-12x^2 +kx-8$ attains its maximum
 value, on the interval $[0,3]$.Find the value of k ? (Ans : 36)

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