DE

LEVEL−I

1. If f(x), g(x) be twice differentiable function on [0, 2] satisfying
$f''(x) = g''(x)$, $f'(1) = 2$, $g'(1) = 4$ and $f(2) = 3$, $g(2) = 9$, then f(x) - g(x) at x = 4 equals
(A) 0 (B) −10 (C) 8 (D) 2

2. $y = ae^{-\frac{1}{x}} + b$ is a solution of $\frac{dy}{dx} = \frac{y}{x^2}$ when
(A) a = 1, b = 0 (B) a = 2, b = 0
(C) a = 1, b = 1 (D) a = 2, b = 2.

3. The solution of differential equation $\frac{dy}{dx} = \frac{y}{x} + \frac{\phi(y/x)}{\phi'(y/x)}$ is
(A) $x\phi(y/x) = k$ (B) $\phi(y/x) = kx$
(C) $y\phi(y/x) = k$ (D) $\phi(y/x) = ky$

4. Solution of differential equation of $(x + 2y^3)\,dy = y\,dx$ is
(A) $x = y^3 + cy$ (B) $y = x^3 + cx$
(C) $x^2 + y^2 = cxy$ (D) none of these

5. The curve, which satisfies the differential equation $\frac{xdy - ydx}{xdy + ydx} = y^2 \sin(xy)$ and passes through (0, 1), is given by
(A) $y(1 - \cos xy) + x = 0$ (B) $\sin xy - x = 0$
(C) $\sin y + y = 0$ (D) $\cos xy - 2y = 0$

6. The solution of the differential equation $x\frac{dy}{dx} = -\frac{y}{2} - \frac{\sin 2x}{2y}$ is given by
(A) $xy^2 = \cos^2 x + c$ (B) $xy^2 = \sin^2 x + c$
(C) $yx^2 = \cos^2 x + c$ (D) None of these

7. Differential equation whose general solution is $y = c_1x + c_2/x$ for all values of c_1 and c_2 is
(A) $\frac{d^2y}{dx^2} + \frac{x^2}{y} + \frac{dy}{dx} = 0$ (B) $\frac{d^2y}{dx^2} + \frac{y}{x^2} - \frac{dy}{dx} = 0$
(C) $\frac{d^2y}{dx^2} + \frac{1}{2x}\frac{dy}{dx} = 0$ (D) $\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} - \frac{y}{x^2} = 0$

8. A particle moves in a straight line with a velocity given by $\frac{dx}{dt} = x + 1$. The time taken by a particle to travels a distance of 99 meters is
(A) $\log_{10} e$ (B) $2\log_e 10$
(C) $2\log_{10} e$ (D) $\frac{1}{2}\log_{10} e$

9. $\left(\frac{d^2y}{dx^2}\right)^2 + x\left(\frac{dy}{dx}\right)^3 = 0$ is a differential equation of
(A) degree 2, order 2 (B) degree 3, order 3
(C) order 2, degree 3 (D) None of these

10. The degree of a differential equation, written as a polynomial in differential coefficients, is defined as
(A) Highest of the orders of the differential coefficients occurring in it
(B) Highest power of the highest order differential coefficients occurring in it
(C) Any power of the highest order differential coefficients occurring in it.
(D) Highest power among the powers of the differential coefficients occurring in it

11. The order of the differential equation, whose general solution is
$y = C e^{x} + C_2 e^{2x} + C_3 e^{3x} + C_4 e^{x+c_5}$, Where C_1, C_2, C_3, C_4, C_5 are arbitrary constants, is
(A) 5 (B) 4 (C) 3 (D) none of these

12. I.F. for y ln $y\frac{dx}{dy} + x - \ln y = 0$ is
(A) ln x (B) ln y (C) ln xy (D) none of these

13. Which one of the following is a differential equation of the family of curves
$y=Ae^{2x} + Be^{-2x}$
(A) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$
(B) $x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - xy + x^2 - 2 = 0$
(C) $\frac{d^2y}{dx^2} = 4y$
(D) $\left(\frac{dy}{dx}\right)^3 = 4y\left(x\frac{dy}{dx} - 2y\right)$

14. The differential equation of $y = ax^2 + bx + c$ is
(A) $y''' = 0$ (B) $y'' = 0$
(C) $y'' + cx = 0$ (D) $y''' + c = 0$

LEVEL–II

1. Which of the following transformations reduce the differential equation $\frac{dz}{dx}+\frac{z}{x}\log z=\frac{z}{x^2}(\log z)^2$ into the form $\frac{d\nu}{dx}+P(x)\nu=Q(x)$

(A) $\nu=\log z$ (B) $\nu=e^z$

(C) $\nu=\frac{1}{\log z}$ (D) $\nu=(\log z)^2$

2. The function f(θ) = $\frac{d}{d\theta}\int_0^\theta \frac{dx}{1-\cos\theta\cos x}$ satisfies the differential equation

(A) $\frac{df}{d\theta}$ + 2f(θ) cotθ = 0 (B) $\frac{df}{d\theta}$ - 2f(θ) cotθ = 0

(C) $\frac{df}{d\theta}$ + 2f(θ) = 0 (D) $\frac{df}{d\theta}$ - 2f(θ) = 0

3. Solution of differential equation $\frac{dy}{dx}$ = sin(x+y) +cos(x+y) is

(A) $\log\left|1+\tan\frac{x+y}{2}\right|$ = x+c (B) $\log\left(1+\sec\frac{x+y}{2}\right)$ = x+c

(C) $\log|1+\tan(x+y)|$ = y+c (D) None of these

4. The degree of the differential equation $\frac{d^3y}{dx^3}+\sqrt{\frac{d^2y}{dx^2}+2}+\frac{dy}{dx}+1=0$ is

(A) 4 (B) 2

(C) 1 (D) None of these

5. The order of the differential equation of the family of circles with one diameter along the line y – x is

(A) 1 (B) 2

(C) 3 (D) none of these

6. If x-intercept of any tangent is 3 times the x-coordinate of the point of tangency, then the equation of the curve, given that it passes through (1,1), is

(A) y = $\frac{1}{x}$ (B) y = $\frac{1}{x^2}$ (C) y = $\frac{1}{\sqrt{x}}$ (D) none of these

7. The equation of the curve, passing through (2,5) and having the area of triangle formed by the x-axis, the ordinate of a point on the curve and the tangent at the point 5 sq units, is

(A) xy = 10 (B) x^2 = 10y (C) y^2 = 10x (D) $xy^{1/2}$ = 10

8. The family passing through (0, 0) and satisfying the differential equation $\frac{y_2}{y_1}=1$ (where y_n = $\frac{d^ny}{dx^n}$) is

(A) y = k (B) y = kx

(C) y = k(e^x+1) (D) y = k(e^x-1)

9. If $y = e^{4x} + 2e^{-x}$ satisfies the relation $\frac{d^3y}{dx^3} + A\frac{dy}{dx} + By = 0$, then value of A and B respectively are

(A) –13, 14 (B) –13, –12
(C) –13, 12 (D) 12, –13

10. Solution of equation $\frac{dy}{dx} = \frac{y\frac{d(\phi(x))}{dx} - y^2}{\phi(x)}$ is

(A) $y = \frac{\phi(x)+c}{x}$ (B) $y = \frac{\phi(x)}{x}+c$ (C) $y = \frac{\phi(x)}{x+y}$ (D) $y = \phi(x)+x+c$

11. The equation of curve through point (1, 0) and whose slope is $\frac{y-1}{x^2+x}$ is

(A) (y-1) (x+1) +2x =0 (B) 2x(y-1) +x+1 =0
(C) $y= \frac{1-x}{1+x}$ (D) None of these

12. If the slope of the tangent at (x,y) to a curve passing through (1, π/4) is given by $y/x - \cos^2 (y/x)$ then the equation of the curve is

(A) $y = \tan^{-1}\log(e/x)$ (B) $y = x \tan^{-1} \log(e/x)$
(C) $x = e^{1+\cot(y/x)}$ (D) $x = e^{1+ \tan(y/x)}$

13. Differential equation of all parabolas whose axes are parallel to y-axis is

(A) $\frac{d^3y}{dx^3} = 0$ (B) $\frac{d^2x}{dy^2} = c$ (C) $\frac{d^3y}{dx^3} + \frac{d^2x}{dy^2} = 0$ (D) $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = c$

14. The curve whose subnormal w.r.t any point is equal to the abscissa of that point is a

(A) Circle (B) Parabola
(B) Ellipse (D) Hyperbola

15. The family whose x and y intercepts of a tangent at any point are respectively double of the x and y coordinates of that point is

(A) $x^2 + y^2 = c$ (B) $x^2 - y^2= c$
(C) xy = c (D) None of these

16. Solution of differential equation $(2x \cos y + y^2 \cos x)\, dx + (2y \sin x - x^2 \sin y)\, dy = 0$ is

(A) $y^2 \sin x + x^2\cos y = k$ (B) $y^2 \cos y + x^2\sin x = k$
(C) $y^2 \cos x + x^2\sin y = k$ (D) None of these.

ANSWERS

LEVEL –I

1.	B	2.	A	3.	B	4.	A
5.	A	6.	A	7.	D	8.	B
9.	A	10.	B	11.	B	12.	B
13.	C	14.	A				

LEVEL –II

1.	C	2.	A	3.	A	4.	B
5.	B	6.	C	7.	A	8.	D
9.	B	10.	C	11.	A	12.	B
13.	A	14.	D	15.	C		
16.	A						