1. Solution of $y(2xy+e^x)dx = e^x dy$ is

(a) $yx^2+e^x=cy$ (b) $xy^2+e^x=cx$

(c) $xy^2+e^{-x}=c$ (d) None of these

2. Solution of $(x^2-4xy-2y^2)dx+(y^2-4xy-2x^2)dy=0$ is

(a) $x^3+y^3-6xy(x+y)=c$

(b) $x^3+y^3+6xy(x-y)=c$

(c) $x^3+y^3+6xy(x+y)=c$

(d) $x^3+y^3-6xy(x-y)=c$

3. Which of the following is a linear differential equation

(a) $\left(\frac{d^2y}{dx^2}\right)^2+x^2\left(\frac{dy}{dx}\right)^2=0$

(b) $y=\frac{dy}{dx}+\sqrt{1+\left(\frac{dy}{dx}\right)^2}$

(c) $\frac{dy}{dx}+\frac{y}{x}=\log x$

(d) $y\frac{dy}{dx}-4=x$

4. The solution of the differential equation

$(1+y^2)+(x-e^{\tan^{-1}y})\frac{dy}{dx}=0$ is

(a) $(x-2)=ke^{\tan^{-1}y}$

(b) $2xe^{\tan^{-1}y}=e^{2\tan^{-1}y}+k$

(c) $xe^{\tan^{-1}y}=\tan^{-1}y+k$

(d) $xe^{2\tan^{-1}y}=e^{\tan^{-1}y}+k$

5. A particle moves in a straight line with a velocity given by $\frac{dx}{dt}=(x+1)$ (x is the distance described). The time taken by a particle to transverse a distance of 99 *metres*

(a) $\log_{10} e$ (b) $2\log_e 10$

(c) $\log_{10} e$ (d) $\frac{1}{2}\log_{10} e$

6. The slope of the tangent at (x, y) to a curve passing through $\left(1,\frac{\pi}{4}\right)$ as given by $\frac{y}{x}-\cos^2\left(\frac{y}{x}\right)$, then the equation of the curve is

(a) $y=\tan^{-1}\left[\log\left(\frac{e}{x}\right)\right]$

(b) $y=x\tan^{-1}\left[\log\left(\frac{x}{e}\right)\right]$

(c) $y=x\tan^{-1}\left[\log\left(\frac{e}{x}\right)\right]$

(d) None of these

7. The equation of the curve which is such that the portion of the axis of x cut off between the origin and tangent at any point is proportional to the ordinate of that point (b is constant of proportionality)

(a) $y=\frac{x}{(a-b\log x)}$

(b) $\log x=by^2+a$

(c) $x^2=y(a-b\log y)$

(d) None of these

8. The solution of the equation $x^2\frac{d^2y}{dx^2}=\ln x$ when $x=1, y=0$ and $\frac{dy}{dx}=-1$ is

(a) $\frac{1}{2}(\ln x)^2+\ln x$ (b) $\frac{1}{2}(\ln x)^2-\ln x$

(c) $-\frac{1}{2}(\ln x)^2+\ln x$ (d) $-\frac{1}{2}(\ln x)^2-\ln x$

9. A continuously differentiable function $\phi(x)$ in $(0, \pi)$ satisfying $y'=1+y^2$, $y(0)=0=y(\pi)$ is

(a) $\tan x$ (b) $x(x-\pi)$

(c) $(x-\pi)(1-e^x)$ (d) Not possible

10. The order and degree of the equation $1+\left(\frac{d^2y}{dx^2}\right)^{5/2}=\left(\frac{dy}{dx}\right)^2$ are respectively

(a) 2, 5 (b) 2, 1 (c) 1, 1 (d) Doesn't exist

11. If y = f (x) be a differentiable function $\forall$ x $\in$ R, then which one of the following is always true:

(a) $\frac{d^2y}{dx^2}-\left(\frac{dx}{dy}\right)^3=0$

(b) $\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^3\frac{d^2x}{dy^2}=0$

(c) $\frac{d^2y}{dx^2}-\left(\frac{dy}{dx}\right)^3=0$

(d) None of these

12. The differential equation of all parabolas whose directrices are parallel to the x-axis is

(a) $\frac{d^3y}{dx^3}=0$

(b) $\frac{d^3x}{dy^3}=0$

(c) $\frac{d^3y}{dx^3+\frac{d^2y}{dx^2}}=0$

(d) None of these

13. The orthogonal trajectories of the family of curve $y = cx^k$ are given by

(a) $x^2 + cy^2$ = constant (b) $x^2 + ky^2$ = constant

(c) $kx^2 + y^2$ = constant (d) $x^2 - ky^2$ = constant

14. Which of the following transformation reduce the differential equation $\frac{dz}{dx}+\frac{z}{x}\log z=\frac{z}{x^2}(\log z)^2$ into the form $\frac{du}{dx}$ + P (x) u = Q (x)?

(a) $u = \log z$ (b) $u = e^z$

(c) $u = (\log z)^{-1}$ (d) $u = (\log z)^2$

15. The solution of the equation

$\left(y+x\sqrt{xy}(x+y)\right)dx-\left(y+y\sqrt{xy}(x+y)\right)dy=0$ is

(a) $x^2+y^2=2\tan^{-1}\sqrt{\frac{y}{x}}+c$

(b) $x^2+y^2=4\tan^{-1}\sqrt{\frac{y}{x}}+c$

(c) $x^2+y^2=\tan^{-1}\sqrt{\frac{y}{x}}+c$

(d) None of these

16. The differential equation of all non-horizontal lines in a plane is

(a) $\frac{d^2y}{dx^2}=0$ (b) $\frac{d^2x}{dy^2}=0$

(c) $\frac{dy}{dx}=0$ (d) $\frac{dx}{dy}=0$

17. The order of the differential equation whose general solution is given by $y=(C_1+C_2)\sin(x+C_3)-C_4e^{x+C_5}$ is

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

18. A solution of the differential equation $\left(\frac{dy}{dx}\right)^2-x\frac{dy}{dx}+y=0$ is

(a) $y = 2$ (b) $y = 2x$

c) $y=2x-4$ (d) $y=2x^2-4.$

19. The differential equation representing the family of curves $y^2=2c\left(x+\sqrt{c}\right)$, where c is a positive parameter, is of

(a) order 1 (b) order 2 (c) degree 3 (d) degree 4

20. If $f(x)$, $g(x)$ be twice differential functions on $[0,2]$ satisfying $f''(x)=g''(x), f'(1)=2g'(1)=4$ and $f(2)=3g(2)=9$, then $f(x)-g(x)$ at $x=4$ equals.

(a) 0 (b) 10 (c) 8 (d) 2

21. The equation of the curve satisfying the differential equation $y_2(x^2+1)=2xy_1$ passing through the point (0,1) and having slope of tangent at x=0 as 3 is

(a) $y=x^2+3x+2$

(b) $y^2=x^2+3x+1$

(c) $y=x^3+3x+1$

(d) None of these

22. The solution curve of $\frac{dy}{dx}=\frac{y^2-2xy-x^2}{y^2+2xy-x^2}$, y(-1) = 1 is-

(a) A parabola (b) Ellipse (c) Circle (d) Straight line

23. The differential equation $y\frac{dy}{dx}+x=k$ $(k\in R)$ represents

(a) Family of circles centered at y axis

(b) Family of circles centered at x axis

(c) Family of rectangular hyperbola's

(d) Family of parabola's whose axis is x-axis

24. The solution of $\frac{d^3y}{dx^3}-8\frac{d^2y}{dx^2}=0$ satisfying $y(0) = 1/8$, $y_1(0) = 0$ and $y_2(0) = 1$ is -

(a) $y=\frac{1}{8}\left(\frac{e^{8x}}{8}-x+\frac{7}{8}\right)$

(b) $y=\frac{1}{8}\left(\frac{e^{8x}}{8}+x+\frac{7}{8}\right)$

(c) $y=\frac{1}{8}\left(\frac{e^{8x}}{8}+x-\frac{7}{8}\right)$

(d) None of these

25. The differential equation representing the family of hyperbola $a^2x^2-b^2y^2=c^2$ is -

(a) $\frac{y''}{y'}+\frac{y'}{y}=\frac{1}{x}$ (b) $\frac{y''}{y'}+\frac{y'}{y}=\frac{1}{x^2}$

(c) $\frac{y''}{y'}-\frac{y'}{y}=\frac{1}{x}$ (d) $\frac{y''}{y'}=\frac{y}{y'}-\frac{1}{x}$

26. The differential equation of the family of hyperbolas with asymptotes as the line x + y = 1 and x - y = 1 is:

(a) $yy' + x = 0$ (b) $yy' = (x-1)$

(c) $yy'' + y' = 0$ (d) $y' + xy = 0$

27. The order of the differential equation of all tangent lines to the parabola $y = x^2$ is

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

28. The equation to the curve which is such that portion of the axis of x cut off between the origin and the tangent at any point is proportional to the ordinate of that point is

(a) $x = y(C - K\log y)$ (b) $\log x = Ky^2 + C$

(c) $x^2 = y(C - K\log y)$ (d) None of these

29. Solution of $(1 + e^{x/y})\,dx + e^{x/y}(1 - x/y)\,dy = 0$ is

(a) $xe^{x/y} + x = c$ (b) $ye^{x/y} - x = c$

(c) $ye^{x/y} + y = c$ (d) $ye^{x/y} + x = c$

30. If f(x) and g(x) are two solutions of the differential equation $ay'' + x^2y' + y = e^x$ then f(x) - g(x) is solution of

(a) $a^2y'' + y' + y = e^x$ (b) $ay'' + y = e^x$

(c) $ay'' + x^2y' + y = 0$ (d) $y'' + x^2y' + y = 0$