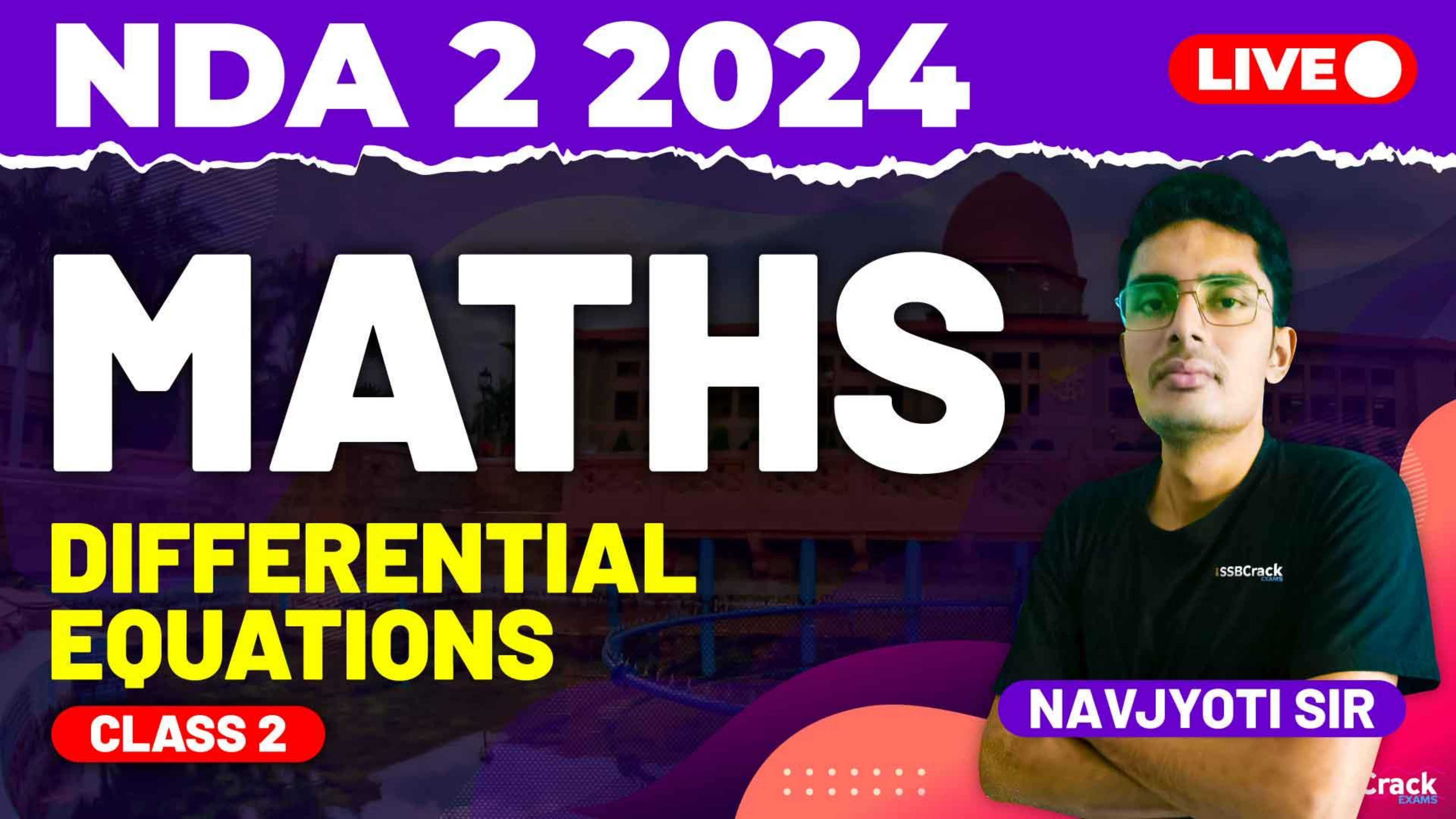

NDA 2 2024
LIVE
MATHS
DIFFERENTIAL EQUATIONS
CLASS 2
SSBCrack EXAMS
NAVJYOTI SIR
Crack EXAMS

04 July 2024 Live Classes Schedule

8:00AM	04 JULY 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	04 JULY 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:00AM	OVERVIEW OF PPDT & PRACTICE	ANURADHA MA'AM

NDA 2 2024 LIVE CLASSES

1:00PM	GS - PHYSICS - CLASS 4	NAVJYOTI SIR
2:30PM	GS - CHEMISTRY MCQS - CLASS 9	SHIVANGI MA'AM
4:00PM	MATHS - DIFFERENTIAL EQUATIONS - CLASS 2	NAVJYOTI SIR
5:30PM	ENGLISH - PARTS OF SPEECH - CLASS 2	ANURADHA MA'AM

CDS 2 2024 LIVE CLASSES

1:00PM	GS - PHYSICS - CLASS 4	NAVJYOTI SIR
2:30PM	GS - CHEMISTRY MCQS - CLASS 9	SHIVANGI MA'AM
5:30PM	ENGLISH - PARTS OF SPEECH - CLASS 2	ANURADHA MA'AM

Q) Consider a differential equation of order m and degree n. Which one of the following pairs is not feasible ? of order and degree ?

(a) $(3,2)$ (b) $(2,3/2)$

(c) $(2,4)$ (d) $(2,2)$

order and degree — both are positive integers (natural numbers)

Q) Consider a differential equation of order m and degree n. Which one of the following pairs is not feasible ?

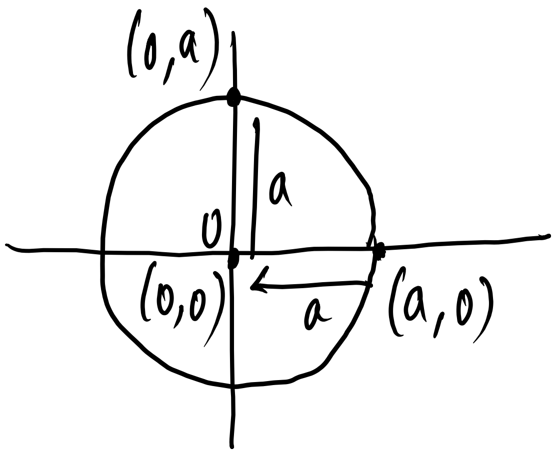
(a) $(3, 2)$
(b) $(2, 3/2)$
(c) $(2, 4)$
(d) $(2, 2)$

Ans: (b)

Q) Which one of the following is the differential equation to family of circles having centre at the origin?

(a) $\left(x^2 - y^2\right)\frac{dy}{dx} = 2xy$ (b) $\left(x^2 + y^2\right)\frac{dy}{dx} = 2xy$

(c) $\frac{dy}{dx} = \left(x^2 + y^2\right)$ (d) ✓ $xdx + ydy = 0$



$(x-0)^2 + (y-0)^2 = a^2$

$x^2 + y^2 = a^2$

$2x + 2y\frac{dy}{dx} = 0$

$x + y\frac{dy}{dx} = 0$

$y\frac{dy}{dx} = -x$

$ydy = -xdx$

$xdx + ydy = 0$

Q) Which one of the following is the differential equation to family of circles having centre at the origin?

(a) $\left(x^2 - y^2\right)\frac{dy}{dx} = 2xy$ (b) $\left(x^2 + y^2\right)\frac{dy}{dx} = 2xy$

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

Ans: (d)

Q) The general solution of the differential equation $\ell n\left(\frac{dy}{dx}\right)+x=0$ is?

(a) $y=e^{-x}+c$

(b) $y=-e^{-x}+c$

(c) $y=e^{x}+c$

(d) $y=-e^{x}+c$

$\ell n\left(\frac{dy}{dx}\right)=-x$

$\frac{dy}{dx}=e^{-x}$

$\int dy=\int e^{-x}\,dx$

$y=-e^{-x}+c$

Q) The general solution of the differential equation

$$\ell n\left(\frac{dy}{dx}\right)+x=0 \text{ is?}$$

(a) $y=e^{-x}+c$

(b) $y=-e^{-x}+c$

(c) $y=e^{x}+c$

(d) $y=-e^{x}+c$

Ans: (b)

SSBCrack EXAMS

Q) What is the degree of the differential equation

$$\left(\frac{d^4y}{dx^4}\right)^{3/5} - 5\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 5 = 0 \ ?$$

(a) 5 (b) 4

(c) 3 (d) 2

$$\left(\frac{d^4y}{dx^4}\right)^{3/5} = 5\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} - 8\frac{dy}{dx} - 5$$

$$\left(\frac{d^4y}{dx^4}\right)^{3} = \left(5\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} - 8\frac{dy}{dx} - 5\right)^5$$

degree = 3

Q) What is the degree of the differential equation

$$\left(\frac{d^4y}{dx^4}\right)^{3/5} - 5\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 5 = 0 \ ?$$

(a) 5 (b) 4

(c) 3 (d) 2

Ans: (c)

SSBCrack EXAMS

Q) The differential equation representing the family of curves $y = a \sin(\lambda x + \alpha)$ is :

(a) $\frac{d^2y}{dx^2} + \lambda^2 y = 0$ (b) $\frac{d^2y}{dx^2} - \lambda^2 y = 0$

(c) $\frac{d^2y}{dx^2} + \lambda y = 0$ (d) None of the above

$y = a\sin(\lambda x + \alpha)$

$a = \frac{y}{\sin(\lambda x + \alpha)}$

$\frac{d^2y}{dx^2} + \lambda^2 y = 0$

$\frac{dy}{dx} = a\cos(\lambda x + \alpha)(\lambda) = a\lambda\cos(\lambda x + \alpha)$

$\frac{d^2y}{dx^2} = -a\lambda^2 \sin(\lambda x + \alpha) = -\frac{y}{\sin(\lambda x + \alpha)} \cdot \lambda^2 \cdot \sin(\lambda x + \alpha) = -\lambda^2 y$

Q) The differential equation representing the family of curves $y = a \sin(\lambda x + \alpha)$ is :

(a) $\frac{d^2y}{dx^2} + \lambda^2 y = 0$

(b) $\frac{d^2y}{dx^2} - \lambda^2 y = 0$

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

(d) None of the above

Ans: (a)

Q) The solution of the differential equation

$$\frac{dy}{dx} = \cos(y - x) + 1 \text{ is}$$

(a) $e^{x}[\sec(y-x) - \tan(y-x)] = c$ ✓

(b) $e^{x}[\sec(y-x) + \tan(y-x)] = c$

(c) $e^{x}\sec(y-x)\tan(y-x) = c$

(d) $e^{x} = c\sec(y-x)\tan(y-x)$

$y - x = t$

$\frac{dy}{dx} - 1 = \frac{dt}{dx} \Rightarrow \frac{dt}{dx} + 1 = \frac{dy}{dx}$

$\frac{dt}{dx} = \cos t$

$\frac{1}{\cos t} dt = dx$

$\int \sec t \, dt = \int dx$

$\log(\sec t + \tan t) = x + c$

$\sec t + \tan t = e^{x+c}$

$\sec t + \tan t = e^{x} \cdot e^{c}$

$e^{-c} = \frac{e^{x}}{\sec t + \tan t}$

$e^{-c} = \frac{e^{x}}{(\sec t + \tan t)} \cdot \frac{(\sec t - \tan t)}{(\sec t - \tan t)}$

$e^{-c} = \frac{e^{x}(\sec t - \tan t)}{\sec^2 t - \tan^2 t}$

$e^{-c} = \frac{e^{x}(\sec t - \tan t)}{1}$

$c = e^{x}(\sec(y-x) - \tan(y-x))$

Q) The solution of the differential equation

$$\frac{dy}{dx} = \cos(y - x) + 1 \text{ is}$$

(a) $e^x[\sec(y - x) - \tan(y - x)] = c$

(b) $e^x[\sec(y - x) + \tan(y - x)] = c$

(c) $e^x \sec(y - x) \tan(y - x) = c$

(d) $e^x = c \sec(y - x) \tan(y - x)$

Ans: (a)

Q) If $y = a\cos 2x + b\sin 2x$, then

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

(c) $\frac{d^2y}{dx^2} - 4y = 0$ ✓(d) $\frac{d^2y}{dx^2} + 4y = 0$

$$\frac{dy}{dx} = -a(\sin 2x)\cdot 2 + b\cos 2x\,(2)$$

$$\frac{d^2y}{dx^2} = -4a\cos 2x - 4b\sin 2x = -4(a\cos 2x + b\sin 2x)$$

$$= -4y$$

$$\frac{d^2y}{dx^2} + 4y = 0$$

Q) If $y = a\cos 2x + b\sin 2x$, then

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

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

(c) $\frac{d^2y}{dx^2} - 4y = 0$

(d) $\frac{d^2y}{dx^2} + 4y = 0$

Ans: (d)

Q) The differential equation of the system of circles touching the Y-axis at the origin is

(a) $x^2 + y^2 - 2xy \frac{dy}{dx} = 0$

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

✓ (c) $x^2 - y^2 + 2xy \frac{dy}{dx} = 0$

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

$(x-a)^2 + (y-0)^2 = a^2$

$x^2 - 2ax + a^2 + y^2 = a^2$

$x^2 - 2ax + y^2 = 0$

$2x - 2a + 2y\frac{dy}{dx} = 0$

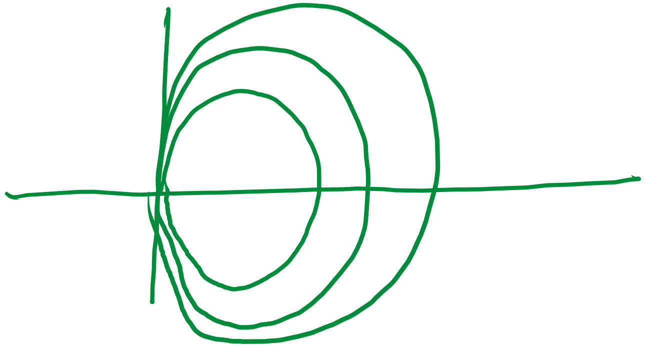
$a = x + y\frac{dy}{dx}$

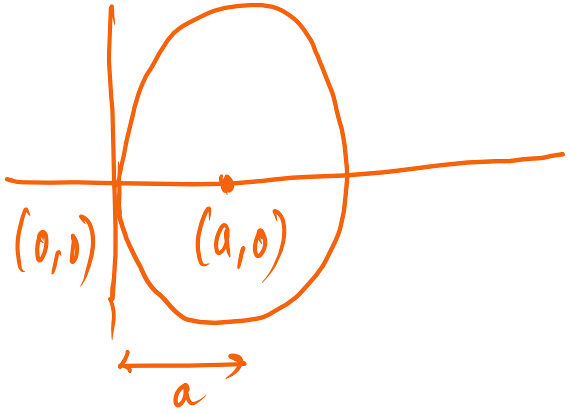
$x^2 - 2\left(x + y\frac{dy}{dx}\right)x + y^2 = 0$

$x^2 - 2x^2 - 2xy\frac{dy}{dx} + y^2 = 0$

$-x^2 + y^2 = 2xy\frac{dy}{dx}$

$x^2 - y^2 + 2xy\frac{dy}{dx} = 0$





Q) The differential equation of the system of circles touching the Y-axis at the origin is

(a) $x^2 + y^2 - 2xy \frac{dy}{dx} = 0$

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

(c) $x^2 - y^2 + 2xy \frac{dy}{dx} = 0$

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

Ans: (c)

Q) Consider the following statements:

1. The general solution of $\frac{dy}{dx} = f(x) + x$ is of the form $y = g(x) + c$, where c is an arbitrary constant.

2. The degree of $\left(\frac{dy}{dx}\right)^2 = f(x)$ is 2.

Which of the above statements is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

$$\int dy = \int \{f(x) + x\}\, dx$$

$$y = \int f(x)\, dx + \int x\, dx$$

$$y = F(x) + \frac{x^2}{2}$$ function of x,

$$y = g(x) + c$$

Q) Consider the following statements:

1. The general solution of $\frac{dy}{dx} = f(x) + x$ is of the form $y = g(x) + c$, where c is an arbitrary constant.

2. The degree of $\left(\frac{dy}{dx}\right)^2 = f(x)$ is 2.

Which of the above statements is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Ans: (c)

Q) The growth of a quantity $N(t)$ at any instant t is given by

$\frac{dN(t)}{dt} = \alpha N(t)$. Given that $N(t) = ce^{kt}$, c is a constant. What

is the value of α?

(a) c

(b) k

(c) $c + k$

(d) $c - k$

$$N(t) = ce^{kt}$$

$$\frac{dN(t)}{dt} = (ce^{kt})(k) = kN(t) = \alpha N(t)$$

$$\alpha = k$$

Q) The growth of a quantity $N(t)$ at any instant t is given by $\frac{dN(t)}{dt} = \alpha N(t)$. Given that $N(t) = ce^{kt}$, c is a constant. What is the value of α?

(a) c

(b) k

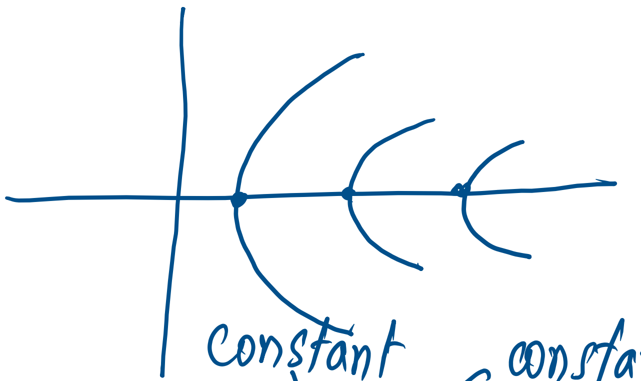
(c) $c + k$

(d) $c - k$

Ans: (b)

Q) The degree and order of the differential equation of the family of all parabolas whose axis is x - axis, are respectively.

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



constant constant

$y^2 = 4a(x+h)$

$2y\frac{dy}{dx} = 4a$

$y' = \frac{2a}{y}$

$a = \frac{yy'}{2}$

$0 = \frac{1}{2}\left(y'(y') + yy''\right)$

$yy'' + (y')^2 = 0$

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

Order = 2

degree = 1

Q) The degree and order of the differential equation of the family of all parabolas whose axis is x - axis, are respectively.

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

Ans: (c)

Q) The solution of the differential equation

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

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

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

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

$$\frac{dx}{dy}=\frac{e^{\tan^{-1}y}-x}{1+y^2}\Rightarrow\frac{dx}{dy}+\frac{x}{1+y^2}=\frac{e^{\tan^{-1}y}}{1+y^2}$$

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

of form, $\frac{dx}{dy} + Px = Q$ (P, Q → $f(y)$)

$$IF = e^{\int P\,dy} = e^{\int \frac{1}{1+y^2} dy} = e^{\tan^{-1}y}$$

Soln.

$$x(IF) = \int Q(IF)\,dy + c$$

$$x\left(e^{\tan^{-1}y}\right) = \int \frac{e^{\tan^{-1}y}}{1+y^2} \cdot e^{\tan^{-1}y}$$

$$xe^{\tan^{-1}y} = \int \left(e^{2\tan^{-1}y}/1+y^2\right) dy$$

$$xe^{\tan^{-1}y} = \frac{e^{2\tan^{-1}y}}{2} + c$$

$$2xe^{\tan^{-1}y} = e^{2\tan^{-1}y} + c$$

Q) The solution of the differential equation

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

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

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

Ans: (c)

Q) Solution of the differential equation $ydx + (x + x^2 y)dy = 0$ is

(a) $\log y = Cx$

(b) $-\frac{1}{xy} + \log y = C$

(c) $\frac{1}{xy} + \log y = C$

(d) $-\frac{1}{xy} = C$

$ydx + (x + x^2 y)dy = 0$

$\frac{dy}{dx} = -\frac{y}{x + x^2 y}$

$\frac{dx}{dy} = -\frac{x}{y} - x^2$

$\frac{dx}{dy} + \frac{x}{y} = x^2$

$$\frac{dx}{dy} + \frac{x}{y} = x^2$$

$$\frac{1}{x^2}\frac{dx}{dy} + \left(\frac{1}{x}\right)\left(\frac{1}{y}\right) = 1 \quad (\text{Divide by } x^2)$$

Let $\frac{1}{x} = t \Rightarrow \frac{-1}{x^2}\frac{dx}{dy} = \frac{dt}{dy}$

$$-\frac{dt}{dy} + t\left(\frac{1}{y}\right) = 1$$

$$\frac{dt}{dy} - \left(\frac{1}{y}\right)t = 1$$

(Linear diff. eqn. — $P = -\frac{1}{y}$, $Q = 1$ } functions of y)

$$IF = e^{\int P\,dy}$$

$$= e^{\int -\frac{1}{y}dy} = e^{-\log y}$$

$$= e^{\log y^{-1}} = y^{-1} = \frac{1}{y}$$

Solution of the differential equation $ydx + (x + x^2 y)dy = 0$ is

(a) $\log y = Cx$

(b) $-\frac{1}{xy} + \log y = C$ ✓

(c) $\frac{1}{xy} + \log y = C$

(d) $-\frac{1}{xy} = C$

$t(IF) = \int (Q)\, IF\, dy + C$

$t\left(\frac{1}{y}\right) = \int 1 \cdot \frac{1}{y}\, dy + C$

$t\left(\frac{1}{y}\right) = \log y + C$

$\frac{1}{xy} = \log y + C$

$-\frac{1}{xy} + \log y = C$

$\log y - \frac{1}{xy} = -C$

(constants can be made this way)

Q) Solution of the differential equation $ydx + (x + x^2 y)dy = 0$ is

(a) $\log y = Cx$

(b) $-\frac{1}{xy} + \log y = C$

(c) $\frac{1}{xy} + \log y = C$

(d) $-\frac{1}{xy} = C$

Ans: (b)

Q) If $x\frac{dy}{dx} = y(\log y - \log x + 1)$, then the solution of the equation is

(a) $y\log\left(\frac{x}{y}\right) = cx$

(b) $x\log\left(\frac{y}{x}\right) = cy$

(c) $\log\left(\frac{y}{x}\right) = cx$

(d) $\log\left(\frac{x}{y}\right) = cy$

$$\frac{dy}{dx} = \frac{y}{x}\left(\log\left(\frac{y}{x}\right) + 1\right)$$

(Homogeneous)

$$y = vx$$

$$\frac{dy}{dx} = v + x\frac{dv}{dx}$$

$$v + x\frac{dv}{dx} = v(\log v + 1)$$

$$x\frac{dv}{dx} = v\log v$$

$$\int \frac{1}{v\log v}\,dv = \int \frac{1}{x}\,dx$$

$$\log(\log v) = \log x + \log c$$

Q) If $x\dfrac{dy}{dx} = y\,(\log y - \log x + 1)$, then the solution of the equation is

(a) $y\log\left(\dfrac{x}{y}\right) = cx$

(b) $x\log\left(\dfrac{y}{x}\right) = cy$

(c) $\log\left(\dfrac{y}{x}\right) = cx$

(d) $\log\left(\dfrac{x}{y}\right) = cy$

Ans: (c)

Q) Let the population of rabbits surviving at time t be governed by the differential equation $\frac{dp(t)}{dt} = \frac{1}{2}p(t) - 200$. If $p(0) = 100$, then $p(t)$ equals:

(a) $600 - 500\,e^{t/2}$

(b) $400 - 300\,e^{-t/2}$

(c) $400 - 300\,e^{t/2}$

(d) $300 - 200\,e^{-t/2}$

Q) Let the population of rabbits surviving at time t be governed by the differential equation $\frac{dp(t)}{dt} = \frac{1}{2}p(t) - 200$. If $p(0) = 100$, then $p(t)$ equals:

(a) $600 - 500\, e^{t/2}$

(b) $400 - 300\, e^{-t/2}$

(c) $400 - 300\, e^{t/2}$

(d) $300 - 200\, e^{-t/2}$

Ans: (d)

Q) At present, a firm is manufacturing 2000 items. It is estimated that the rate of change of production P w.r.t. additional number of workers x is given by $\frac{dP}{dx} = 100 - 12\sqrt{x}$. If the firm employs 25 more workers, then the new level of production of items is

(a) 2500 (b) 3000 (c) 3500 (d) 4500

Q) At present, a firm is manufacturing 2000 items. It is estimated that the rate of change of production P w.r.t. additional number of workers x is given by $\frac{dP}{dx} = 100 - 12\sqrt{x}$. If the firm employs 25 more workers, then the new level of production of items is

(a) 2500 (b) 3000 (c) 3500 (d) 4500

Ans: (c)

Q) The solution of $\frac{dy}{dx} = |x|$ is :

(a) $y = \frac{x|x|}{2} + c$

(b) $y = \frac{|x|}{2} + c$

(c) $y = \frac{x^2}{2} + c$

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

Where c is an arbitary constant

Q) The solution of $\frac{dy}{dx} = |x|$ is :

(a) $y = \frac{x|x|}{2} + c$

(b) $y = \frac{|x|}{2} + c$

(c) $y = \frac{x^2}{2} + c$

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

Where c is an arbitary constant

Ans: (a)

Q) What is the degree of the differential equation

$$y = x\frac{dy}{dx} + \left(\frac{dy}{dx}\right)^{-1} ?$$

(a) 1
(b) 2
(c) -1
(d) Degree does not exist.

Q) What is the degree of the differential equation

$$y = x\frac{dy}{dx} + \left(\frac{dy}{dx}\right)^{-1}?$$

(a) 1

(b) 2

(c) −1

(d) Degree does not exist.

Ans: (b)

Q) What does the differential equation $y\frac{dy}{dx}+x=a$ (where a is a constant) represent?

(a) A set of circles having centre on the Y-axis

(b) A set of circles having centre on the X-axis

(c) A set of ellipses

(d) A pair of straight lines

Q) What does the differential equation $y\frac{dy}{dx} + x = a$ (where a is a constant) represent?

(a) A set of circles having centre on the Y-axis

(b) A set of circles having centre on the X-axis

(c) A set of ellipses

(d) A pair of straight lines

Ans: (b)

Q) If the solution of the differential equation

$$\frac{dy}{dx} = \frac{ax+3}{2y+f}$$

represents a circle, then what is the value of a?

(a) 2 (b) 1

(c) -2 (d) -1

Q) If the solution of the differential equation

$$\frac{dy}{dx} = \frac{ax+3}{2y+f}$$

represents a circle, then what is the value of a?

(a) 2

(b) 1

(c) –2

(d) –1

Ans: (c)

Q) What is the order of the differential equation of all ellipses whose axes are along the coordinate axes?

(a) 1 (b) 2

(c) 3 (d) 4

Q) What is the order of the differential equation of all ellipses whose axes are along the coordinate axes?

(a) 1 (b) 2

(c) 3 (d) 4

Ans: (b)

Q) What is the differential equation of

$$y = A - \frac{B}{x}?$$

(a) $xy_2 + y_1 = 0$ (b) $xy_2 + 2y_1 = 0$

(c) $xy_2 - 2y_1 = 0$ (d) $2xy_2 + y_1 = 0$

Q) What is the differential equation of

$y = A - \dfrac{B}{x}$?

(a) $xy_2 + y_1 = 0$ (b) $xy_2 + 2y_1 = 0$

(c) $xy_2 - 2y_1 = 0$ (d) $2xy_2 + y_1 = 0$

Ans: (b)

Q) A particle starts from origin with a velocity (in m/s) given by the equation $\frac{dx}{dt} = x + 1$. The time (in second) taken by the particle to traverse a distance of 24 m is

(a) ln24 (b) ln5

(c) 2ln5 (d) 2ln4

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(a) ln24　　(b) ln5

(c) 2ln5　　(d) 2ln4

Ans: (c)

Q) What is the degree of the following differential equation?

$$x = \sqrt{1 + \frac{d^2y}{dx^2}}$$

(a) 1

(b) 2

(c) 3

(d) Degree is not defined

Q) What is the degree of the following differential equation?

$$x = \sqrt{1 + \frac{d^2y}{dx^2}}$$

(a) 1

(b) 2

(c) 3

(d) Degree is not defined

Ans: (a)

Q) What is the solution of the differential equation $\ln\left(\frac{dy}{dx}\right) = ax + by$?

(a) $ae^{ax} + be^{by} = C$

(b) $\frac{1}{a}e^{ax} + \frac{1}{b}e^{by} = C$

(c) $ae^{ax} + be^{-by} = C$

(d) $\frac{1}{a}e^{ax} + \frac{1}{b}e^{-by} = C$

Q) What is the solution of the differential equation $\ln\left(\frac{dy}{dx}\right) = ax + by$?

(a) $ae^{ax} + be^{by} = C$

(b) $\frac{1}{a}e^{ax} + \frac{1}{b}e^{by} = C$

(c) $ae^{ax} + be^{-by} = C$

(d) $\frac{1}{a}e^{ax} + \frac{1}{b}e^{-by} = C$

Ans: (d)

Q) What is the solution of the differential equation $\frac{dx}{dy} = \frac{x+y+1}{x+y-1}$?

(a) $y - x + 4\ln(x + y) = C$
(b) $y + x + 2\ln(x + y) = C$
(c) $y - x + \ln(x + y) = C$
(d) $y + x + 2\ln(x + y) = C$

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(d) $y + x + 2\ln(x+y) = C$

Ans: (c)

Q) Match List I (Differential equation) with List II (Its solution) and select the correct answer using the codes given below the lists.

List I	List II
A. $yy' = \sec^2 x$	1. $y \sec^2 x = \sec x + C$
B. $y' = x \sec y$	2. $xy = \sin x + C$
C. $y' + (2 \tan x)\, y = \sin x$	3. $y^2 = 2 \tan x + C$
D. $xy' + y = \cos x$	4. $x^2 = 2 \sin y + C$

Codes

	A	B	C	D
(a)	3	2	1	4
(b)	4	1	2	3
(c)	3	4	1	2
(d)	3	2	4	1

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Ans: (c)

Q) What does the solution of the differential equation $x\,dy - y\,dx = 0$ represent?

(a) Rectangular hyperbola
(b) Straight line passing through (0, 0)
(c) Parabola with vertex at (0, 0)
(d) Circle with centre at (0, 0)

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Ans: (b)

Q) The general solution of the differential equation

$$\frac{dy}{dx} + \sin\left(\frac{x+y}{2}\right) = \sin\left(\frac{x-y}{2}\right) \text{ is}$$

(a) $\log \tan\left(\frac{y}{2}\right) = C - 2\sin x$

(b) $\log \tan\left(\frac{y}{4}\right) = C - 2\sin\left(\frac{x}{2}\right)$

(c) $\log \tan\left(\frac{y}{2} + \frac{\pi}{4}\right) = C - 2\sin x$

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Ans: (b)

Q) Which one of the following equations represents the differential equation of circles, with centres on the x-axis and all passing through the origin?

(a) $\frac{dy}{dx} = \frac{x^2 + y^2}{2xy}$

(b) $\frac{dy}{dx} = \frac{x^2 - y^2}{2xy}$

(c) $\frac{dy}{dx} = \frac{y^2 - x^2}{2xy}$

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Ans: (c)

Q) What is the degree of the differential equation

$$\frac{dy}{dx} + x = \left(y - x\frac{dy}{dx}\right)^{-4}?$$

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

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

Ans: (c)

Q) The solution of the differential equation

$$\frac{dy}{dx} + \frac{y}{x\log x} = \frac{1}{x} \text{ is}$$

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

(c) $y = \frac{1}{2}\log x + \frac{C}{(\log x)^2}$ (d) $y = \frac{1}{3}\log x - C\,(\log x)^{-1}$

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Ans: (a)

Q) What is the equation of the curve passing through the point $\left(0, \frac{\pi}{3}\right)$ satisfying the differential equation $\sin x \cos y \, dx + \cos x \sin y \, dy = 0$?

(a) $\cos x \cos y = \frac{\sqrt{3}}{2}$

(b) $\sin x \sin y = \frac{\sqrt{3}}{2}$

(c) $\sin x \sin y = \frac{1}{2}$

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(d) $\cos x \cos y = \frac{1}{2}$

Ans: (d)

Q) Which one of the following differential equations represents the system of circles touching the y-axis at the origin?

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

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

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

Ans: (c)

Q) The order and degree of the differential equation

$$\left(1+3\frac{dy}{dx}\right)^{2/3} = 4\frac{d^3y}{dx^3} \text{ are}$$

(a) $(1, \frac{2}{3})$

(b) $(3, 1)$

(c) $(3, 3)$

(d) $(1, 2)$

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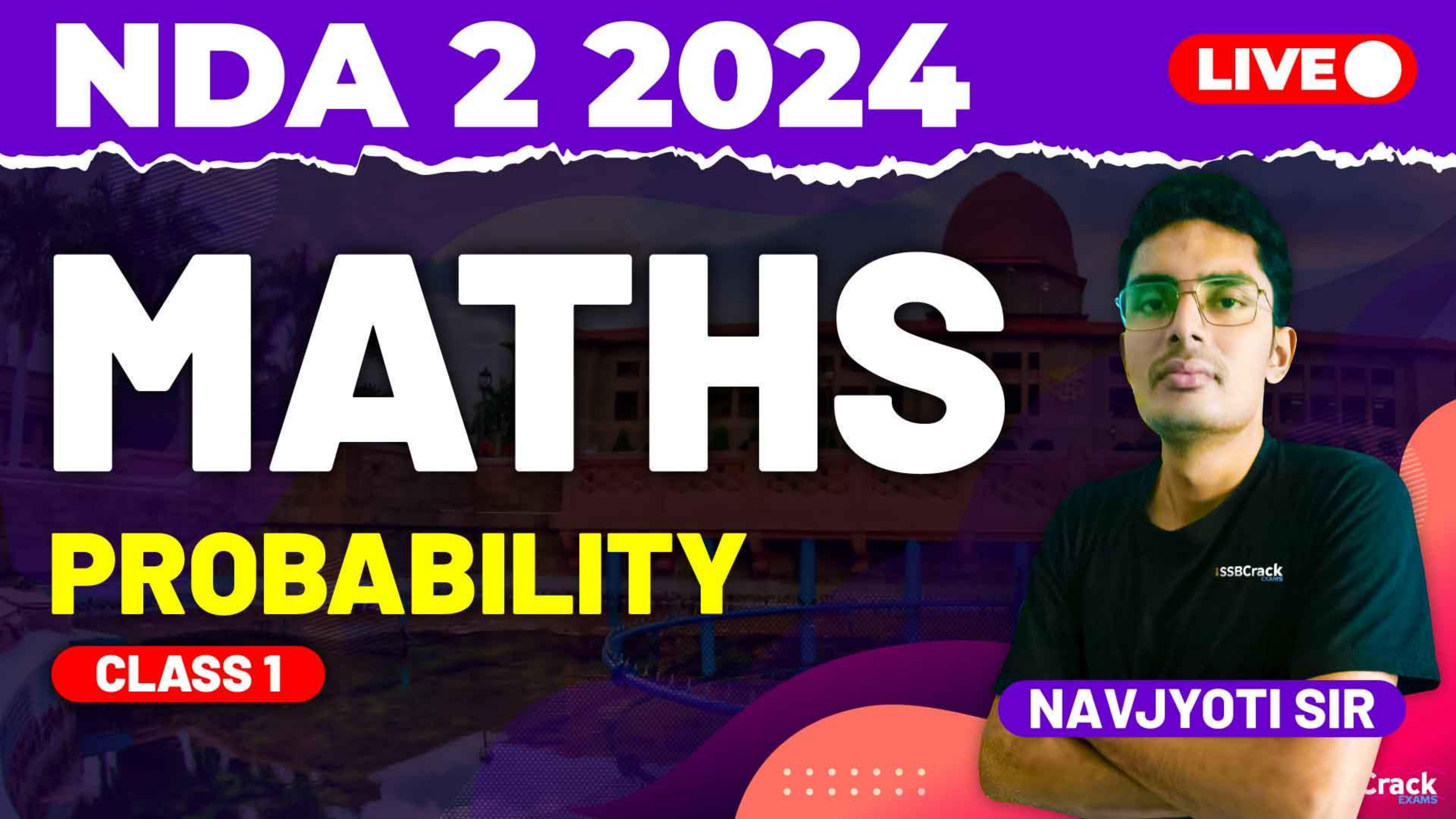
Ans: (c)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