



MATHS

BOOKS - VK JAISWAL MATHS (HINGLISH)

DIFFERENTIAL EQUATIONS

Exercise Single Choice Problems

1. $\frac{dy}{dx} \left(\frac{1 + \cos x}{y} \right) = -\sin x$ and $f\left(\frac{\pi}{2}\right) = -1$, then $f(0)$ is:

A. 2

B. 1

C. 3

D. 4

Answer: A



[Watch Video Solution](#)

2. The differential equation satisfied by family of curves

$y = Ae^x + Be^{3x} + Ce^{5x}$ where A,B,C are arbitrary constants is:

A. $\frac{d^3y}{dx^3} - 9\frac{d^2y}{dx^2} + 23\frac{dy}{dx} + 15y = 0$

B. $\frac{d^3y}{dx^3} - 9\frac{d^2y}{dx^2} - 23\frac{dy}{dx} + 15y = 0$

C. $\frac{d^3y}{dx^3} + 9\frac{d^2y}{dx^2} - 23\frac{dy}{dx} + 15y = 0$

D. $\frac{d^3y}{dx^3} + 9\frac{d^2y}{dx^2} + 23\frac{dy}{dx} - 15y = 0$

Answer: D

[Watch Video Solution](#)

3. If $y = y(x)$ and it follows the relation $e^{xy^2} + y \cos(x^2) = 5$ then $y'(0)$

is equal to

A. 4

B. -16

C. -4

D. 16

Answer: B



Watch Video Solution

4. If $(x^2 + y^2)dy = xydx$ and $y(1)=1$ and $y(x_o) = e$, then $x_o =$

A. $\sqrt{3}e$

B. $\sqrt{e^2 - \frac{1}{2}}$

C. $\sqrt{\frac{e^2 - 1}{2}}$

D. $\sqrt{e^2 + \frac{1}{2}}$

Answer: A



Watch Video Solution

5. The differential equation $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{y}$ determines a family of circular with

- A. Variable radii and fixed centre at $(0, 1)$
- B. Variable radii and fixed centre at $(0, -1)$
- C. Fixed radius 1 and variable centres along y-axis
- D. Fixed radius 1 and variable centres along x-axis

Answer: C



[Watch Video Solution](#)

6. Interval contained in the domain of definition of non-zero solutions of the differential equation $(x - 3)^2 y' + y = 0$

- A. $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
- B. $\left(\frac{\pi}{2}, \frac{3\pi}{2}\right)$
- C. $\left(\frac{\pi}{8}, \frac{5\pi}{4}\right)$

D. $(-\pi, \pi)$

Answer: A

 Watch Video Solution

7. A function $y = f(x)$ satisfies

$$(x + 1)f'(x) - 2(x^2 + x)f(x) = \frac{e^x - 2}{(x + 1)}, \forall x > 1. \text{ If } f(0) = 5, \text{ then}$$

$f(x)$ is (a)

(b)(c) $\left((d)(e)(f) \frac{(g)3x + 5}{h} ((i)x + 1)(j)(k)(l) \right) (m)e^n (o)(p)x^{((q)2)(r)} (s)$

(w) (b) **[Math Processing Error]** (ss) (c)

(d)(e) $\left((f)(g)(h) \frac{(i)6x + 5}{j} ((k)x + 1)(l)(m)(n) \right) (o)e^p (q)(r)x^{((s)2)(t)} (u)$

(y) (d) **[Math Processing Error]** (uu)

A. $\left(\frac{3x + 5}{x + 1} \right) \cdot e^{x^2}$

B. $\left(\frac{6x + 5}{x + 1} \right) \cdot e^{x^2}$

C. $\left(\frac{6x + 5}{(x + 1)^2} \right) \cdot e^{x^2}$

D. $\left(\frac{5x + 6x}{x + 1} \right) \cdot e^{x^2}$

Answer: B



Watch Video Solution

8. The solution of the differential equation

$$2x^2y \frac{dy}{dx} = \tan(x^2y^2) - 2xy^2, \text{ given } y(1) = \sqrt{\frac{\pi}{2}}, \text{ is}$$

A. $\sin(x^2y^2) - 1 = 0$

B. $\cos\left(\frac{\pi}{2} + x^2y^2\right) + x = 0$

C. $\sin(x^2y^2) = e^{x-1}$

D. $\sin(x^2y^2) = e^{(x-1)}$

Answer: C



Watch Video Solution

9. The differential equation whose general solution is given by

$$y = \left(c_1 \cos(x + c_2) - \left(c_3 e^{(-x+c_4)} + (c_5 \sin x)\right), \text{ where } c_1, c_2, c_3, c_4, c_5$$

are arbitrary constants, is (a)

$$(b)(c)(d) \frac{(e)(f)d^{(g)4(h)}(i)y}{j} \left((k)d(l)x^{(m)4(n)}(o) \right) (p)(q) - (r) \frac{(s)(t)d^{(u)}}{x}$$

(gg) (hh)

$$(ii)(jj)(kk) \frac{(ll)(mm)d^{(nm)3(oo)}(pp)y}{qq} \left((rr)d(ss)x^{(tt)3(uu)}(vv) \right) (ww) (\times$$

$$+ (mmm) \frac{(nnn)dy}{ooo} ((ppp)dx)(qqq)(rrr) + y = 0(sss)$$

(ttt) (uuu)

$$(vvv)(www) (\times x) \frac{(yyy)(zzz)d^{(aaaa)5(bbbb)}(cccc)}{dddd} \left((eeee)d(ffff)x^{(gggg)5} \right)$$

(mmmm) (nnnn)

$$(oooo)(pppp)(qqqq) \frac{(rrrr)(ssss)d^{(tttt)3(uuuu)}(vvvv)y}{wwww} \left((xxxx)d(yyyy)x^{(zzzz)} \right)$$

$$- (eeee) \frac{(fffff)(ggggg)d^{(hhhhh)2(iiiii)}(jjjjj)y}{kkkkk} \left((llll)d(mmmmm)x^{(nnnnn)} \right)$$

$$= 0(yyyyy)$$

(zzzzz)

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

B. $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + \frac{dy}{dx} - y = 0$

C. $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$

D. $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

Answer: C



Watch Video Solution

10. If $y = e^{(\alpha+1)x}$ be solution of differential equation

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0, \text{ then } \alpha \text{ is:}$$

A. 0

B. 1

C. -1

D. 2

Answer: B



Watch Video Solution

11. The order and degree of the differential equation

$$\left(\frac{dy}{dx}\right)^{1/3} - 4\frac{d^2y}{dx^2} - 7x = 0 \text{ are } \alpha \text{ and } \beta, \text{ then the value of } (\alpha + \beta)$$

is:

A. 3

B. 4

C. 2

D. 5

Answer: D



Watch Video Solution

12. General solution of differential equation of

$$f(x) \frac{dy}{dx} = f^2(x) + yf(x) + f'(x)y \text{ is:}$$

(c being arbitrary constant.)

A. $y = f(x) + ce^x$

B. $y = -f(x) + ce^x$

C. $y = -f(x) + ce^x f(x)$

D. $y = cf(x) + e^x$

Answer: C



[Watch Video Solution](#)

13. The order and degree respectively of the differential equation of all tangent lines to parabola $x^2 = 2y$ is:

A. 1, 2

B. 2, 1

C. 1, 1

D. 1, 3

Answer: A



[Watch Video Solution](#)

14. The general solution of the differential equation

$\frac{dy}{dx} + x(x + y) = x(x + y)^3 - 1$ is:

$$\text{A. } \ln \left| \frac{(x+y+1)(x+y-1)}{(x+y)^4} \right| = x^2 + C$$

$$\text{B. } \ln \left| \frac{(x+y+1)(x+y-1)}{(x+y)^2} \right| = x^2 + C$$

$$\text{C. } 2 \ln \left| \frac{(x+y+1)(x+y-1)}{(x+y)^2} \right| = x^2 + C$$

$$\text{D. } \ln \left| \frac{(x+y+1)(x+y-1)}{(x+y)^2} \right| = x + C$$

Answer: B



Watch Video Solution

15. The general solution of $\frac{dy}{dx} = 2y \tan x + \tan^2 x$ is:

$$\text{A. } y \cos^2 x = \frac{x}{2} - \frac{\sin 2x}{4} + C$$

$$\text{B. } y \sec^2 x = \frac{x}{2} - \frac{\sin 2x}{4} + C$$

$$\text{C. } y \cos^2 x = \frac{x}{2} - \frac{\cos 2x}{4} + C$$

$$\text{D. } y \cos^2 x = \frac{x}{2} - \frac{\sin 2x}{4} + C$$

Answer: A



Watch Video Solution

16. The solution of differential equation $\frac{d^2y}{dx^2} = \frac{dy}{dx}$, $y(0) = 3$ and $y'(0) = 2$:

- A. is a periodic function
- B. approaches to zero as $x \rightarrow -\infty$
- C. has an asymptote parallel to x-axis
- D. has an asymptote parallel to y-axis

Answer: C



Watch Video Solution

17. The solution of the differential equation $(x^2 + 1) \frac{d^2y}{dx^2} = 2x \frac{dy}{dx}$ under the conditions $y(0)=1$ and $y'(0)=3$, is

A. $y = x^2 + 3x + 1$

B. $y = x^3 + 3x + 1$

C. $y = x^4 + 3x + 1$

D. $y = 3 \tan^{-1} x + x^2 + 1$

Answer: B



Watch Video Solution

18. The differential equation of the family of curves $cy^2 = 2x + c$ (where c is an arbitrary constant.) is:

A. $\frac{xdy}{dx} = 1$

B. $\left(\frac{dy}{dx}\right) = \frac{2xly}{dx} + 1$

C. $y^2 = 2xy \frac{dy}{dx} + 1$

D. $y^2 = \frac{2ydy}{dx} + 1$

Answer: C



Watch Video Solution

19. solution of the equation $\frac{dy}{dx} + \frac{1}{x}\tan y = \frac{1}{x^2}\tan y \sin y$ is

A. $2y = \sin y(1 - 2cx^2)$

B. $2x = \cot y(1 + 2cx^2)$

C. $2x = \sin y(1 - 2cx^2)$

D. $2x \sin y = 1 - 2cx^2$

Answer: C



Watch Video Solution

20. Solution of the differential equation $xdy - \sqrt{x^2 + y^2}dx = 0$ is :

A. $y - \sqrt{x^2 + y^2} = cx^2$

B. $y + \sqrt{x^2 + y^2} = cx$

C. $x = \sqrt{x^2 + y^2} = cx^2$

D. $y + \sqrt{x^2 + y^2} = cx^2$

Answer: D



Watch Video Solution

21. Let $f(x)$ be differentiable on the interval $(0, \infty)$ such that $f(1) = 1$

and $\lim_{t \rightarrow x} \frac{t^2 f(x) - x^2 f(t)}{t - x} = 1$ for each $x > 0$. Then $f(x) =$

A. $\frac{1}{4x} + \frac{3x^2}{4}$

B. $\frac{3}{4x} + \frac{x^2}{4}$

C. $\frac{1}{4x} + \frac{x^3}{4}$

D. $\frac{1}{4x^3} + \frac{3x}{4}$

Answer: C



Watch Video Solution

22. The population $p(t)$ at time t of a certain mouse species satisfies the

differential equation $\left(dp \frac{t}{dt} = 0.5p(t) - 450 \right)$ If $p(0) = 850$, then the

time at which the population becomes zero is (1) $2 \ln 18$ (2) $\ln 9$ (3) $\frac{1}{2} \ln$

18 (4) $\ln 18$

A. $\frac{1}{2} \ln 18$

B. $\ln 18$

C. $2 \ln 18$

D. $\ln 9$

Answer: C



Watch Video Solution

23. The solution of the differential equation $\sin 2y \frac{dy}{dx} + 2 \tan x \cos^2 y = 2 \sec x \cos^3 y$ is: (where C is arbitrary constant)

A. $\cos y \sec x = \tan x + C$

B. $\sec y \cos x = \tan x + C$

C. $\sec y \sec x = \tan x + C$

D. $\tan y \sec x = \sec x + C$

Answer: C



Watch Video Solution

24. The solution of the differential equation $\frac{dy}{dx} = (4x + y + 1)^2$, is

A. $4x + y + 1 = 2 \tan(2x + y + C)$

B. $4x + y + 1 = 2 \tan(x + 2y + C)$

C. $4x + y + 1 = 2 \tan(2y + c)$

D. $4x + y + 1 = 2 \tan(2x + c)$

Answer: D



Watch Video Solution

25. If a curve is such that line joining origin to any point $P(x, y)$ on the curve and the line parallel to y-axis through P are equally inclined to tangent to curve at P, then the differential equation of the curve is:

A. $x \left(\frac{dy}{dx} \right) - 2y \frac{dy}{dx} = x$

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

C. $x \left(\frac{dy}{dx} \right)^2 - 2x \frac{dy}{dx} = x$

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

Answer: A



Watch Video Solution

26. If $y = f(x)$ satisfy the differential equation

$\frac{dy}{dx} + \frac{y}{x} = x^2$, $f(1) = 1$, then value of $f(3)$ equals:

A. 7

B. 5

C. 9

D. 27

Answer: A



Watch Video Solution

27. Let $y = f(x)$ and $\frac{x}{y} \frac{dy}{dx} = \frac{3x^2 - y}{2y - x^2}$, $f(1) = 1$ then the possible value of $\frac{1}{3}f(3)$ equals :

A. 9

B. 4

C. 3

D. 2

Answer: C



Watch Video Solution

Exercise One Or More Than One Answer Is Are Correct

1. Let $y = f(x)$ be a real valued function satisfying $x \frac{dy}{dx} = x^2 + y - 2$, $f(1) = 1$, then :

A. $f(x)$ is minimum at $x = 1$

B. $f(x)$ is maximum at $x = 1$

C. $f(3) = 5$

D. $f(2) = 3$

Answer: A::C



Watch Video Solution

2. solution of differential equation $x \cos x \frac{dy}{dx} + y(x \sin x + \cos x) = 1$ is

A. $xy = \sin x + c \cos x$

B. $xy \sec x = \tan x + c$

C. $xy + \sin x + c \cos x = 0$

D. None of these

Answer: A::B



Watch Video Solution

3. If a function satisfies

$$(x - y)f(x + y) - (x + y)f(x - y) = 2(x^2y - y^3) \forall x, y \in R \text{ and } f(1) =$$

, then

A. $f(x)$ must be polynomial function

B. $f(3) = 12$

C. $f(0) = 0$

D. $f(3) = 13$

Answer: A::B::C

[Watch Video Solution](#)

4. A function $y=f(x)$ satisfies the differential equation $f(x)\sin 2x - \cos x + (1 + \sin^2 x)f'(x) = 0$ with initial condition $y(0) = 0$. The value of $f\left(\frac{\pi}{6}\right)$ is equal to (A) $\frac{1}{5}$ (B) $\frac{3}{5}$ (C) $\frac{4}{5}$ (D) $\frac{2}{5}$

A. $\frac{2}{5}$

B. $\frac{3}{5}$

C. $\frac{1}{5}$

D. $\frac{4}{5}$

Answer: A

[Watch Video Solution](#)

5. Solution of the differential equation

$$(2 + 2x^2\sqrt{y})ydx + (x^{21}\sqrt{y} + 2)xdy = 0 \text{ is/are:}$$

A. $xy(x^2\sqrt{y} + 5) = c$

B. $xy(x^2\sqrt{y} + 3) = c$

C. $xy(y^2\sqrt{x} + 3) = c$

D. $xy(y^2\sqrt{x} + 5) = c$

Answer: B

 [View Text Solution](#)

6. If $y(x)$ satisfies the differential equation

$\frac{dy}{dx} = \sin 2x + 3y \cot x$ and $y\left(\frac{\pi}{2}\right) = 2$ then which of the following

statement (s) is/are correct ?

A. $y\left(\frac{\pi}{6}\right) = 0$

B. $y'\left(\frac{\pi}{3}\right) = \frac{9 - 3\sqrt{2}}{2}$

C. $y(x)$ increases in the interval

D. $\int_{-\pi/2}^{\pi/2} y(x) dx = x$

Answer: A::C



Watch Video Solution

Exercise Comprehension Type Problem

1. A differentiable function $y = g(x)$ satisfies $\int_0^x (x - t + 1)g(t)dt = x^4 + x^2$ for all $x \geq 0$ then $y=g(x)$ satisfies the differential equation

A. $\frac{dy}{dx} - y = 12x^2 + 2$

B. $\frac{dy}{dx} + 2y = 12x^2 + 2$

C. $\frac{dy}{dx} + y = 12x^2 + 2$

D. $\frac{dy}{dx} + y = 12x + 2$

Answer: C



Watch Video Solution

2. A differentiable function $y = g(x)$ satisfies

$$\int_0^x (x - t + 1)g(t)dt = x^4 + x^2 \text{ for all } x \geq 0 \text{ then } y=g(x) \text{ satisfies the}$$

differential equation

A. 0

B. 1

C. e^2

D. Data insufficient

Answer: A



Watch Video Solution

3. Suppose f and g are differentiable functions such that

$$xg(f(x))f'(g(x))g'(x) = (g(x))g'(f(x))f'(x) \forall x \in R \text{ and } f \text{ is}$$

positive

$$\forall n \in R.$$

Also

$$\int_0^x f(g(t))dt = \frac{1}{2}(1 - e^{-2x}) \forall x \in R, g(f(0)) = 1 \text{ and } h(x) = \frac{g(f(x))}{f(g(x))}$$

The graph of $y = h(x)$ is symmetric with respect to line:

A. $x = -1$

B. $x = 0$

C. $x = 1$

D. $x = 2$

Answer: C



Watch Video Solution

4. Let f and g be differentiable functions such that:

$$xg(f(x))f'(g(x))g'(x) = f(g(x))g'(f(x))f'(x) \forall x \in R \quad \text{Also,}$$

$$f(x) > 0 \text{ and } g(x) > 0 \forall x \in R \quad \int_0^x f(g(t))dt = 1 - \frac{e^{-2x}}{2}, \forall x \in R$$

$$\text{and } g(f(0)) = 1, h(x) = \frac{g(f(x))}{f(g(x))} \forall x \in R \text{ Now answer the question:}$$

$$f(g(0)) + g(f(0)) = \text{(A) 1 (B) 2 (C) 3 (D) 4}$$

A. 1

B. 2

C. 3

D. 4

Answer: B

 Watch Video Solution

5. Suppose f and g are differentiable functions such that $xg(f(x))f'(g(x))g'(x) = f(g(x))g'(f(x))f'(x) \forall x \in R$ and f is positive $\forall n \in R$. Also

$$\int_0^x f(g(t))dt = \frac{1}{2}(1 - e^{-2x}) \forall x \in R, g(f(0)) = 1 \text{ and } h(x) = \frac{g(f(x))}{f(g(x))}$$

The largest possible value of $h(x) \forall x \in R$ is:

A. 1

B. $e^{1/3}$

C. e

D. e^2

Answer: C

 Watch Video Solution

6. Given a function 'g' which has a derivative $g'(x)$ for every real x and satisfies $g'(0) = 2$ and $g(x + y) = e^y g(x) + e^y g(y)$ for all x and y then:

A. $x(2 + xe^x)$

B. $e(e^x + 1)$

C. $2xe^x$

D. $x + \ln(x + 1)$

Answer: C



Watch Video Solution

7. Given a function 'g' which has a derivative $g'(x)$ for every real x and satisfies $g'(0) = 2$ and $g(x + y) = e^y g(x) + e^y g(y)$ for all x and y then:

A. R

B. $\left[-\frac{2}{e}, \infty \right)$

C. $\left[-\frac{1}{e}, \infty\right)$

D. $[0, \infty)$

Answer: B



Watch Video Solution

8. Given a function 'g' which has a derivative $g'(x)$ for every real x and satisfies $g'(0) = 2$ and $g(x + y) = e^y g(x) + e^x g(y)$ for all x and y then:

A. 0

B. 1

C. 2

D. Does not exist

Answer: A



Watch Video Solution

Exercise Matching Type Problems

1. Match the following Columns

Column-I (Differential equation)	Column-II Solution (Integral curves)
(A) $y - x \frac{dy}{dx} = y^2 + \frac{dy}{dx}$	(P) $y = A_1 x^2 + A_2 x + A_3$
(B) $(2x - 10y^3) \frac{dy}{dx} + y = 0$	(Q) $x^2 y^2 + 1 = cy$
(C) $\left(\frac{dy}{dx}\right) \left(\frac{d^3 y}{dx^3}\right) - 3 \left(\frac{d^2 y}{dx^2}\right)^2 = 0$	(R) $(x+1)(1-y) = cy$
(D) $(x^2 y^2 - 1) dy + 2xy^3 dx = 0$	(S) $x = A_1 y^2 + A_2 y + A_3$
	(T) $xy^2 = 2y^5 + c$



View Text Solution

Column-I	Column-II
(A) Solution of differential equation $[3x^2 y + 2xy - e^x(1+x)]dx + (x^3 + x^2)dy = 0$ is :	(P) $y^2(x^2 + 1 + ce^{x^2}) = 1$
(B) Solution of differential equation $ydx - xdy - 3xy^2 e^{x^2} dx = 0$ is :	(Q) $(x^2 + x^3)y - xe^x = c$
(C) Solution of differential equation $\frac{dy}{dx} = xy(x^2 y^2 - 1)$ is :	(R) $\frac{x}{y} - \frac{3}{2} e^{x^2} = c$
(D) Solution of differential equation $\frac{dy}{dx}(x^2 y^3 + xy) = 1$ is :	(S) $\frac{1}{x} = 2 - y^2 + ce^{-y^2/2}$
(where c is arbitrary constant).	(T) $\frac{2}{x} = 1 - y^2 + ce^{-y/2}$

2.



View Text Solution

Exercise Subjective Type Problems

1. Find the value of $|a|$ for which the area of triangle included between the coordinate axes and any tangent to the curve $x^4y = \lambda^a$ is constant (where λ is constant.),

 [View Text Solution](#)

2. Let $y = f(x)$ satisfies the differential equation $xy(1 + y)dx = dy$. If $f(0) = 1$ and $f(2) = \frac{e^2}{k - e^2}$, then find the value of k .

 [Watch Video Solution](#)

3. If $y^2 = 3 \cos^2 x + 2 \sin^2 x$, then the value of $y^4 + y^3 \frac{d^2y}{dx^2}$ is

 [Watch Video Solution](#)

4. Let $f(x)$ be a differentiable function in $[-1, \infty)$ and $f(0) = 1$ such

that $\lim_{t \rightarrow x+1} \frac{t^2 f(x+1) - (x+1)^2 f(t)}{f(t) - f(x+1)} = 1$. Find the value of $\lim_{x \rightarrow 1} \frac{\ln(f(x)) - \ln 2}{x - 1}$



[Watch Video Solution](#)

5. Let $y = (a \sin x + (b + c) \cos x) e^{x+d}$, where a, b, c and d are parameters represent a family of curves, then differential equation for the given family of curves is given by $h'' - \alpha y' + \beta y = 0$, then $\alpha + \beta =$



[Watch Video Solution](#)

6. Let $y = f(x)$ satisfies the differential equation $xy(1+y)dx = dy$. If $f(0) = 1$ and $f(2) = \frac{e^2}{k - e^2}$, then find the value of k .



[Watch Video Solution](#)