MATHS

BOOKS - OSWAAL PUBLICATION MATHS (KANNADA ENGLISH)

DIFFERENTIAL EQUATIONS

Basic Concepts Short Answer Type Questions I

1. Form the differential equation of the family of parabolas having vertex at origin and axis along positive y-axis.

Watch Video Solution

2. Find the order and degree of the differential equation, $\left(\frac{ds}{dt}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$

Watch Video Solution

3. Find the order and degree of the differential equation, $xy, \frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 - y\frac{dy}{dx} = 0.$

Watch Video Solution

4. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b. $\frac{x}{a} + \frac{y}{b} = 1$

Watch Video Solution

5. Find the order and the degree of the differential equation

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

Watch Video Solution

6. Find the order and degree, if defined of the differential equation, $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 - \sin.\frac{dy}{dx} + 1 = 0.$

Watch Video Solution

7. Find the order and the degree of the differential equation

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

Watch Video Solution

8. Find the differential equation of the family of all straight lines passing through the origin.

Watch Video Solution

9. The general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x}$ is

Watch Video Solution

10. If m and n are the order and degree, respectively of the differential equation $y\left(\frac{dy}{dx}\right)^3 + x^3\left(\frac{d^2y}{dx^2}\right)^2 - xy = \sin x$, then write the value of m + n.

Watch Video Solution

11. Write the differential equation representing the curve $y^2 = 4ax$, where a is an arbitrary constant.

Watch Video Solution

12. Write the degree of the differential equation $\left(\frac{d^2s}{dt^2}\right) + \left(\frac{d^3s}{dt}\right)^3 + 4 = 0.$

Watch Video Solution

13. Write the degree of the differential equation $x^3\left(\frac{d^2y}{dx^2}\right)^2 + x\left(\frac{dy}{dx}\right)^4 = 0.$

Watch Video Solution

14. Write the degree of the differential equation $\left(\frac{dy}{dx}\right)^4 = 3x\,\frac{d^2y}{dx^2} = 0.$

Watch Video Solution

15. Write the degree of the differential equation :

$$x\left(\frac{d^2y}{dx^2}\right)^3 + y\left(\frac{dy}{dx}\right)^4 + x^3 = 0$$

Watch Video Solution

16. Write the differential equation formed from the equation $y = mx + c$, here m and c are arbitrary constants.

Watch Video Solution

17. Write the degree of the differential equations :

$$\left(\frac{d^2y}{dx^2}\right) - 2.\frac{d^2y}{dx^2} - \frac{dy}{dx} + 1 = 0.$$

Watch Video Solution

18. Write the degree of the differential equation :

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

Watch Video Solution

Basic Concepts Short Answer Type Questions Ii

1. Find the differential equation representing the family of curves $y=a\sin(x+b)$, where a,b are arbitrary constants.

Watch Video Solution

2. The differential equations of all circles touching the x-axis at origin is

Watch Video Solution

Basic Concepts Long Answer Type Questions Ii

1. Form the differential equation of the family of circles touching the y-axis at origin.

Watch Video Solution

2. Form the differential equation of the family of parabolas having vertex at origin and axis along positive y-axis.

Watch Video Solution

3. Form the differential equation of the family of circles having centre on y-axis and radius 3 units.

Watch Video Solution

4. Form the differential equation representing the family of ellipses having foci on x-axis and centre at the origin.

Watch Video Solution

5. Form the differential equation of the family of circles in the second quadrant and touching the coordinate axes.

Watch Video Solution

6. Find the differential equation of all the circles in the first quadrant which touch the coordinate axes.

Watch Video Solution

7. Form the differential equation representing the family of parabolas having vertex at origin and axis along positive direction of x-axis.

Watch Video Solution

8. Obtain the differential equation of all circles of radius r.

Watch Video Solution

Variable Separable Method Short Answer Type Questions Ii

1. Find the equation of the curve passing through the point $(-2, 3)$ given that the slope of the tangent to the curve at any point $(x, y) is \frac{2x}{y^2}$.

Watch Video Solution

2. Find the equation of the curve passing through the point (1, 1) whose differential equation is $xdy = \left(2x^2 + 1\right)dx(x \neq 0)$.

Watch Video Solution

3. Solve the following differential equation: $\frac{dy}{dx} = \frac{1 - \cos x}{1 + \cos x}$

Watch Video Solution

Variable Separable Method Long Answer Type Questions Ii

1. Find the general solution of the differential equations

$e^x \tan y dx + (1 - e^x)\sec^2 y dy = 0$

Watch Video Solution

2. If $y(x)$ is a solution of the differential equation $\left(\frac{2 + \sin x}{1 + y}\right)\frac{dy}{dx} = -\cos x$ and $y(0) = 1$, then find the value of $y\left(\frac{\pi}{2}\right)$.

Watch Video Solution

3. Find the particular solution of the differential equation

$e^x \sqrt{1 - y^2} dx + \frac{y}{x} dy = 0,$ given that $y = 1$ when $x = 0$

Watch Video Solution

4. Solve the following differential equation:

$$\cos ec\, x \log y \frac{dy}{dx} + x^2 y^2 = 0$$

Watch Video Solution

5. Find the particular solution of the differential equation

$$\frac{dy}{dx} = \frac{x(2\log x + 1)}{(\sin y + y\cos y)}, \quad \text{given that} \quad y = \frac{\pi}{2} \quad \text{when} \quad x = 1.$$

Watch Video Solution

6. Find the particular solution of the differential equation

$$\frac{dy}{dx} = 1 + x + y + xy, \text{ given that y = 0 when x = 1.}$$

Watch Video Solution

7. Find the particular solution of the differential equation $x\left(1+y^2\right)dx - y\left(1+x^2\right)dy = 0$, given that y = 1 when x = 0.

Watch Video Solution

8. Find the particular solution of the differential equation $\frac{\log(dy)}{dx} = 3x + 4y$ given that $y = 0$ when $x = 0$.

Watch Video Solution

9. Solve the differential equation $\left(x^2 - yx^2\right)dy + \left(y^2 + x^2y^2\right)dx = 0,$ given that y = 1 when

x = 1.

Watch Video Solution

10. Find the particular solution of the following differential equation: $\frac{dy}{dx} = 1 + x^2 + y^2 + x^2y^2$, given that $y = 1$ when $x = 0$.

Watch Video Solution

11. Find the particular solution of the following differential equaiton :

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

Watch Video Solution

12. Find the particular solution of the differential equation $xy\frac{dy}{dx} = (x+2)(y+2)$, it being given that y = -1 when x = 1.

Watch Video Solution

13. Find the particular solution of the differential equation :

$x\left(x^2-1\right)\frac{dy}{dx} = 1;\ y = 0;$ when $x = 2$

Watch Video Solution

14. Solve the following differential equation:

$3e^x \tan y\, dx + (2-e^x)\sec^2 y\, dy = 0,$ given that when $x = 0,\ y = \frac{\pi}{4}.$

Watch Video Solution

Watch Video Solution

15. Solve the following differential equation:

$e^x \tan y \, dx + (1 - e^x)\sec^2 y \, dy = 0$

Watch Video Solution

16. Solve the following differential equation :

$(1 + y^2)(1 + \log x)dx + x\backslash \, dy = 0$

Watch Video Solution

17. Find the particular solution of the differential equation $(1 + e^{2x})dy + (1 + y^2)e^x dx = 0$, given that $y = 1$ when $x = 0$.

Watch Video Solution

18. Solve the following differential equation: $\sqrt{1+x^2+y^2+x^2\,y^2}+xy\frac{dy}{dx}=0$

Watch Video Solution

19. Find the particular solution of the differential equation satisfying the given conditions: $\frac{dy}{dx}=y\tan x,$ given that $y=1$ when $x=0$

Watch Video Solution

20. Solve the following differential equation: $\left(x^3+x^2+x+1\right)\frac{dy}{dx}=2x^2+x$

Watch Video Solution

Linear Differential Equations Long Answer Type Questions I

1. Find the particular solution of the differential equation. $\frac{dy}{dx} + y\cot x = 4x \ \operatorname{cosec} x, \ (x \neq 0), \quad$ given that $\quad y = 0$ when $x = \frac{\pi}{2}$.

Watch Video Solution

2. $ydx - \left(x + 2y^2\right)dy = 0$

Watch Video Solution

3. Solve the differential equation $\frac{dy}{dx} + y \sec x = \tan x, 0 \leq x < \frac{\pi}{2}$.

Watch Video Solution

4. Find the general solution of the differential equation $\frac{dy}{dx} + y \cot x = 2x + x^2 . \cot x$.

Watch Video Solution

5. Find the particular solution of the differential equation $\frac{dy}{dx} + \frac{2xy}{1+x^2} = 1$ when y = 0 and x = 1.

Watch Video Solution

6. Solve $(x \log x)\frac{dy}{dx} + y = \frac{2}{x}\log x.$

Watch Video Solution

7. Solve the following differential equation :

$$\frac{(x^2 - 1)dy}{dx} + 2xy = \frac{2}{(x^2 - 1)}$$

Watch Video Solution

8. Solve $\left(1 + x^2\right)\frac{dy}{dx} + y = e^{\tan^{-1} x}.$

Watch Video Solution

9. Solve the differential equation: $\frac{dy}{dx} + y\cot x = 2\cos x$

Watch Video Solution

10. $\frac{dy}{dx} + 2y \tan x = \sin x$

Watch Video Solution

11. Find the particular solution of the following differential equation :

$\frac{dy}{dx} - y = \cos x$ for x = 0, y = 1.

Watch Video Solution

12. Find the particular solution of the following differential equaiton given that at x = 2, y = 1

$x. \frac{dy}{dx} + 2y = x^2, (x \neq 0)$

Watch Video Solution

13. Solve the following differential equation:

$\left(1+x^2\right)dy+2xy\,dx=\cot x\,dx;\,x\neq 0$

Watch Video Solution

14. Solve the following differential equation :

$x.\,\frac{dy}{dx}+y-x+xy\cot x=0,\,x\neq 0.$

Watch Video Solution

15. Solve $\left[\frac{e^{-2\sqrt{x}}}{\sqrt{x}}-\frac{y}{\sqrt{x}}\right]\frac{dx}{dy}=1(x\neq 0$

Watch Video Solution

16. Solve the following differential equation:

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

Watch Video Solution

17. Solve the following differential equation:

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

Watch Video Solution

18. $x dy - \left(y + 2x^2\right) dx = 0$

Watch Video Solution

19. $x dy + (y - x^3) dx = 0$

Watch Video Solution

20. Solve the following differential equation:

$(1 + y + x^2) dx + (x + x^3) dy = 0$

Watch Video Solution

21. Find the particular solution of the following differential equation satisfying the given condition :

$\frac{(3x^2 + y) dx}{dy} = x,\ x > 0,$ when $x = 1,\ y = 1$

Watch Video Solution

22. Find the particular solution of the differential equation($\tan^{-1} y - x)dy = (1 + y^2)dx$, given that when $x = 0,\ y = 0$.

Watch Video Solution

23. Find the particular solution of the differential equaiton $(x - \sin y)dy + (\tan y)dx = 0$, given that y = 0 when x = 0.

Watch Video Solution

Homogeneous Differential Equations Long Answer Type Questions Ii

1. In a bank, principle p increases continuously at the rate of 5% per year. Find the principal in terms of time t.

Watch Video Solution

2. Show that the differential equation $x^2\frac{dy}{dx} = \left(x^2 - 2y^2 + xy\right)$ is homogenous and solve it.

Watch Video Solution

3. Find the equation of a curve passing through $\left(1, \frac{\pi}{4}\right)$ if the slope of the tangent to the curve at any point P(x, y) is $\frac{y}{x} - \cos^2.\frac{y}{x}$

Watch Video Solution

4. Find the particular solution of the differential equation $x\frac{dy}{dx} = y + x\,\text{cosec}\left(\frac{y}{x}\right) = 0;$ given that $y = 0$ when $x = 1.$

Watch Video Solution

5. Find the particular solution of the differential equation $\left\{x\frac{\sin^2 y}{x} - y\right\}dx + xdy = 0,$ it being given that $y = \frac{\pi}{4}$ when $x = 1.$

Watch Video Solution

6. Solve the following differential equation $x\cos\left(\frac{y}{x}\right)\frac{dy}{dx} = y\cos\left(\frac{y}{x}\right) + x, x \neq 0.$

Watch Video Solution

7. Find the particular solution of the differentia equation : $2ye^{x/y}dx + \left(y - 2xe^{x/y}\right)dx = 0$, given that x = 0 when y = 1.

Watch Video Solution

8. Find the particular solution of the differential equation $x.\frac{dy}{dx} - y + \sin\left(\frac{y}{x}\right) = 0$, given that when x = 2, $y = \pi$.

Watch Video Solution

9. Solve the following differential equation:

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

Watch Video Solution

10. Solve the following differential equaiton :

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

Watch Video Solution

11. Solve the following differential equaiton :

$$ye^{x/y} dx = \left(xe^{x/y} + y\right) dy.$$

Watch Video Solution

12. Show that the given differential equation is homogeneous and solve it.$ydx + x\log\left(\frac{y}{x}\right)dy - 2xdy = 0$

Watch Video Solution

13. Solve the following differential equation:

$y\,dx + x\log\left(\frac{y}{x}\right)dy = 2x\,dy$

Watch Video Solution

14. Solve the following differential equation:

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

Watch Video Solution

15. Solve the following differential equations

$(i) x\frac{dy}{dx} = y - x\tan\frac{y}{x}$

$(ii)\left(x\cos(\mathrm{y})/(\mathrm{x}) + \mathrm{y}\sin\frac{y}{x}\right)ydx = \left(y\frac{\sin(y)}{x} - x\frac{\cos(y)}{x}\right)xdy$

Watch Video Solution

Homogeneous Differential Equations Long Answer Type Questions Iii

1. $\left(x^2 + xy\right)dy = \left(x^2 + y^2\right)dx$

Watch Video Solution

2. Find the particular solution of the differential equation :

$xe^{y/x} - y\sin.\left(\frac{y}{x}\right) + x.\frac{dy}{dx}\sin\left(\frac{y}{x}\right) = 0$ For x = 1, y = 0

Watch Video Solution

3. Find the particular solution of the differential equation $(3xy + y^2)dx + (x^2 = xy)dy = 0; f \text{ or } x = 1, y = 1.$

Watch Video Solution

4. Find the particular solution of the differential equation :

$x^2dy = y(x + y)dx = 0$, when x = 1, y = 1.

Watch Video Solution

5. Show that the differential equation $x\frac{dy}{dx}\sin\left(\frac{y}{x}\right) + x - y\sin\left(\frac{y}{x}\right) = 0$ is homogenous. Find

the particular solution of this differential equation, given that $x = 1$ when $y = \frac{\pi}{2}$.

Watch Video Solution

6. Show that the differentia equation $\left(xe^{y/x} + y\right)$ dx = x dy is homogeneous. Find the particular solution of this differential equation, given that x = 1 when y = 1.

Watch Video Solution

7. Show that the differential equation $\left[x\sin^2\left(\frac{y}{x}\right) - y\right]dx + xdy = 0$ is homogeneous. Find the particular solution of this differential equation, given that $y = \frac{\pi}{4}$ when x = 1.

Watch Video Solution

8. Find the particular solution of the differential equation :

$(xdy - ydx)y\sin\left(\frac{y}{x}\right) = (ydx + xdy)x\cos\left(\frac{y}{x}\right)$, given that $y = \pi$ when x = 3.

Watch Video Solution