EXERCISE 9.1 - Question No. 1

Determine order and degree (if defined) of differential equations

given $\frac{d^4y}{dx^4} + \sin(y'') = 0$

EXERCISE 9.1 - Question No. 2

Determine order and degree (if defined) of differential equations

given $y' + 5y = 0$

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EXERCISE 9.1 - Question No. 3

Determine order and degree (if defined) of differential equations given $\left(\frac{ds}{dt}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$

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EXERCISE 9.1 - Question No. 4

Determine order and degree (if defined) of differential equations given $\left(\frac{d^2y}{dx^2}\right)^2 + \cos\left(\frac{dy}{dx}\right) = 0$

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EXERCISE 9.1 - Question No. 5

Determine order and degree (if defined) of differential equations

given $\frac{d^2y}{dx^2} = \cos 3x + \sin 3x$

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EXERCISE 9.1 - Question No. 6

Determine order and degree (if defined) of differential equations

given $(y''')^2 + (y'')^3 + (y')^4 + y^5 = 0$

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EXERCISE 9.1 - Question No. 7

Determine order and degree (if defined) of differential equations

given $y^m + 2y'' + y' = 0$

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EXERCISE 9.1 - Question No. 8

Determine order and degree (if defined) of differential equations

given $y' + y = e^x$

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EXERCISE 9.1 - Question No. 9

Determine order and degree (if defined) of differential equations

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

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EXERCISE 9.1 - Question No. 10

Determine order and degree (if defined) of differential equations

given $y'' + 2y' + \sin y = 0$

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EXERCISE 9.1 - Question No. 11

The degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$$ (A) 3 (B) 2 (C) 1

(D) not defined

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EXERCISE 9.1 - Question No. 12

The order of the differential equation $2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$

is (A) 2 (B) 1 (C) 0 (D) not defined

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EXERCISE 9.2 - Question No. 1

Verify that the given functions (explicit or implicit) is a solution

of the corresponding differential equation:

$y = e^x + 1 : y'' - y' = 0$

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EXERCISE 9.2 - Question No. 2

Verify that the given functions (explicit or implicit) is a solution

of the corresponding differential equation: $(2) y = x^2 + 2x + C$

$: y' - 2x - 2 = 0 \; (3) y = \cos x + c : y' + \sin x = 0$

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EXERCISE 9.2 - Question No. 3

Verify that the given functions (explicit or implicit) is a solution

of the corresponding differential equation: $y = \cos x + C$:

$y' + \sin x = 0$

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EXERCISE 9.2 - Question No. 4

Verify that the given functions (explicit or implicit) is a solution

of the corresponding differential equation: $y = \sqrt{1 + x^2}$:

$y' = \dfrac{xy}{1 + x^2}$

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EXERCISE 9.2 - Question No. 5

Verify that the given functions (explicit or implicit) is a solution

of the corresponding differential equation: 'y=sqrt(1+x^2) :

y'=xy/1+x^2' $y = Ax : xy' = y(x \neq 0)$

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EXERCISE 9.2 - Question No. 6

Verify that the given functions (explicit or implicit) is a solution

of the corresponding differential equation: $y = xs \in x$:

$xy' = y + x\sqrt{x^2 - y^2}(x \neq 0 \text{ and} x > y \text{ or } x < y)$

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EXERCISE 9.2 - Question No. 7

Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation: $xy = \log y + C$: $y' = \frac{y^2}{1 - xy} (xy \neq 1)$

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EXERCISE 9.2 - Question No. 8

Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation: $y \cos y = x$: (y sin y + cos y + x) y = y

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EXERCISE 9.2 - Question No. 9

Verify that the given functions (explicit or implicit) is a solution

of the corresponding differential equation: $x + y = \tan^{-1} y$:

$y^2 y' + y^2 + 1 = 0$

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EXERCISE 9.2 - Question No. 10

Verify that the given functions (explicit or implicit) is a solution

of the corresponding differential equation:

$y = \sqrt{a^2 - x^2} x \in (-x, a) : x + y\frac{dy}{dx} = 0 (y \neq 0)$

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EXERCISE 9.2 - Question No. 11

The number of arbitrary constants in the general solution of a differential equation of fourth order are: (A) 0 (B) 2 (C) 3 (D) 4

EXERCISE 9.2 - Question No. 12

The number of arbitrary constants in the particular solution of a differential equation of third order are: (A) 3 (B) 2 (C) 1 (D) 0

EXERCISE 9.3 - Question No. 1

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

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EXERCISE 9.3 - Question No. 2

Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b.

$y^2=a\left(b^2-x^2\right)$

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EXERCISE 9.3 - Question No. 3

Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b.

$y = ae^{3x} + be^{-2x}$

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EXERCISE 9.3 - Question No. 4

Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b.

$y = e^{2x}(a + bx)$

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EXERCISE 9.3 - Question No. 5

Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b. $y = ex (a \cos x + b \sin x)$

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EXERCISE 9.3 - Question No. 6

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

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EXERCISE 9.3 - Question No. 7

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

EXERCISE 9.3 - Question No. 8

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

EXERCISE 9.3 - Question No. 9

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

EXERCISE 9.3 - Question No. 10

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

EXERCISE 9.3 - Question No. 11

Which of the following differential equations has

$y = c_1 e^x + c_2 e^{-x}$ as the general solution? (A) $\frac{d^2y}{dx^2} + y = 0$

(B) $\frac{d^2y}{dx^2} - y = 0$ (C) $\frac{d^2y}{dx^2} + 1 = 0$ (D) $\frac{d^2y}{dx^2} - 1 = 0$

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EXERCISE 9.3 - Question No. 12

Which of the following differential equations has y = x as one of

its particular solution? (A) $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = x$ (B)

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

`(d^2y)/(dx^2)+x(dy)/(dx)+x y=0

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EXERCISE 9.4 - Question No. 1

Find the general solution of the differential equations

$$\frac{dy}{dx} = \frac{1 - \cos x}{1 + \cos x}$$

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EXERCISE 9.4 - Question No. 2

Find the general solution of the differential equations

$$\frac{dy}{dx} = \sqrt{4 - y^2}(-2 < y < 2)$$

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EXERCISE 9.4 - Question No. 3

Find the general solution of the differential equations

$$\frac{dy}{dx} + y = 1 (y \neq 1)$$

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EXERCISE 9.4 - Question No. 4

Find the general solution of the differential equations

$$\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0$$

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EXERCISE 9.4 - Question No. 5

Find the general solution of the differential equations

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

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EXERCISE 9.4 - Question No. 6

Find the general solution of the differential equations

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

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EXERCISE 9.4 - Question No. 7

Find the general solution of the differential equations y log y dx

x dy = 0

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EXERCISE 9.4 - Question No. 8

Find the general solution of the differential equations

$$x^5 \frac{dy}{dx} = -y^5$$

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EXERCISE 9.4 - Question No. 9

Find the general solution of the differential equations

$$\frac{dy}{dx} = \sin^{-1} x$$

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EXERCISE 9.4 - Question No. 10

Find the general solution of the differential equations

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

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EXERCISE 9.4 - Question No. 11

The differential equations, find a particular solution satisfying the given condition: $\left(x^3 + x^2 + x + 1\right)\frac{dy}{dx} = 2x^2 + x; y = 1$ when $x = 0$

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EXERCISE 9.4 - Question No. 12

The differential equations, find a particular solution satisfying the given condition: $x\left(x^2-1\right)\frac{dy}{dx}=1; y=0$ when $x=2$

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EXERCISE 9.4 - Question No. 13

The differential equations, find a particular solution satisfying the given condition: $\cos\left(\frac{dy}{dx}\right)=a(a\in R); y=1$

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EXERCISE 9.4 - Question No. 14

The differential equations, find a particular solution satisfying the given condition: $\frac{dy}{dx} = y \tan x; y = 1$ when x = 0

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EXERCISE 9.4 - Question No. 15

Find the equation of a curve passing through the point (0, 0) and whose differential equation is $y' = ex \sin x$

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EXERCISE 9.4 - Question No. 16

For the differential equation $xy\frac{dy}{dx} = (x+2)(y+2)$, find the solution curve passing through the point $(1, 1)$.

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EXERCISE 9.4 - Question No. 17

Find the equation of a curve passing through the point $(0, 2)$ given that at any point (x, y) on the curve, the product of the slope of its tangent and y coordinate of the point is equal to the x coordinate of the point.

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EXERCISE 9.4 - Question No. 18

At any point (x, y) of a curve, the slope of the tangent is twice the slope of the line segment joining the point of contact to the point $(4, 3)$. Find the equation of the curve given that it passes through $(2, 1)$.

EXERCISE 9.4 - Question No. 19

The volume of spherical balloon being inflated changes at a constant rate. If initially its radius is 3 units and after 3 seconds it is 6 units. Find the radius of balloon after t seconds.

EXERCISE 9.4 - Question No. 20

In a bank, principal increases continuously at the rate of r% per year. Find the value of r if Rs 100 double itself in 10 years $\left(\log e^2 = 0.6931\right)$

EXERCISE 9.4 - Question No. 21

In a bank, principal increases continuously at the rate of 5% per year. An amount of Rs 1000 is deposited with this bank, how much will it worth after 10 years $\left(e^{0.5} = 1.648\right)$

EXERCISE 9.4 - Question No. 22

In a culture, the bacteria count is 1,00,000. The number is increased by 10% in 2 hours. In how many hours will the count reach 2,00,000, if the rate of growth of bacteria is proportional to the number present?

EXERCISE 9.4 - Question No. 23

The general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$ is

(A) $e^x + e^{-y} = C$ (B) $e^x + e^y = C$ (C) $e^{-x} + e^y = C$ (D)

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

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EXERCISE 9.5 - Question No. 1

Show that the given differential equation is homogeneous and solve each of them. $(x^2 + xy)dy = (x^2 + y^2)dx$

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EXERCISE 9.5 - Question No. 2

Show that the given differential equation is homogeneous and solve each of them. $y' = \frac{x + y}{x}$

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EXERCISE 9.5 - Question No. 3

Show that the given differential equation is homogeneous and solve each of them. $(xy)dy(x+y)dx = 0$

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EXERCISE 9.5 - Question No. 4

Show that the given differential equation is homogeneous and solve each of them. $\left(x^2 - y^2\right)dx + 2xydy = 0$

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EXERCISE 9.5 - Question No. 5

Show that the given differential equation is homogeneous and solve each of them. $x^2 \frac{dy}{dx} = x^2 - 2y^2 + xy$

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EXERCISE 9.5 - Question No. 6

Show that the given differential equation is homogeneous and solve each of them. $xdy - ydx = \sqrt{x^2 + y^2}dx$

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EXERCISE 9.5 - Question No. 7

Show that the given differential equation is homogeneous and solve each of them.

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

EXERCISE 9.5 - Question No. 8

Show that the given differential equation is homogeneous and solve each of them. $x\frac{dy}{dx}-y+x\sin\left(\frac{y}{x}\right)=0$

EXERCISE 9.5 - Question No. 9

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

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EXERCISE 9.5 - Question No. 10

Show that the given differential equation is homogeneous and solve each of them. $\left(1 + e^{\frac{x}{y}}\right)dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right)dy = 0$

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EXERCISE 9.5 - Question No. 11

The differential equations , find the particular solution satisfying the given condition: $(x+y)dy+(xy)dx=0; y=1$ when $x=1$

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EXERCISE 9.5 - Question No. 12

The differential equations , find the particular solution satisfying the given condition: $x^2dy+\left(xy+y^2\right)dx=0;$ y = 1 when x = 1

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EXERCISE 9.5 - Question No. 13

The differential equations , find the particular solution satisfying the given condition: $\left[x\sin^2\left(\frac{y}{x}\right)-y\right]dx+xdy=0; y=\frac{\pi}{4}$ when x = 1

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EXERCISE 9.5 - Question No. 14

The differential equations , find the particular solution satisfying the given condition: $\frac{dy}{dx}-\frac{y}{x}+\cos ec\left(\frac{y}{x}\right)=0; y=0$ when x = 1

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EXERCISE 9.5 - Question No. 15

The differential equations , find the particular solution satisfying the given condition: $2xy + y^2 - 2x^2 \frac{dy}{dx} = 0; y = 2$ when x = 1

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EXERCISE 9.5 - Question No. 16

A homogeneous differential equation of the from $\frac{dx}{dy} = h\left(\frac{x}{y}\right)$ can be solved by making the substitution. (A) $y = vx$ (B) $v = yx$ (C) $x = vy$ (D) $x = v$

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EXERCISE 9.5 - Question No. 17

Which of the following is a homogeneous differential equation?

(A) $(4x+6y+5)dy(3y+2x+4)dx=0$ (B)

$(xy)dx-\left(x^3+y^3\right)dy=0$ (C) $\left(x^3+2y^2\right)dx+2xydy=0$

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

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EXERCISE 9.6 - Question No. 1

Find the general solution of the differential equations:

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

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EXERCISE 9.6 - Question No. 2

Find the general solution of the differential equations:

$$\frac{dx}{dy} + 3y = e^{-2x}$$

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EXERCISE 9.6 - Question No. 3

Find the general solution of the differential equations:

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

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EXERCISE 9.6 - Question No. 4

Find the general solution of the differential equations:

$$\frac{dx}{dy} + \sec xy = \tan x \left(0 \leq x < \frac{\pi}{2}\right)$$

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EXERCISE 9.6 - Question No. 5

Find the general solution of the differential equations:

$$\cos^2 x \frac{dx}{dy} + y = \tan x \left(0 \leq x < \frac{\pi}{2}\right)$$

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EXERCISE 9.6 - Question No. 6

Find the general solution of the differential equations:

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

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EXERCISE 9.6 - Question No. 7

Find the general solution of the differential equations:

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

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EXERCISE 9.6 - Question No. 8

Find the general solution of the differential equations:

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

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EXERCISE 9.6 - Question No. 9

Find the general solution of the differential equations:

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

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EXERCISE 9.6 - Question No. 10

Find the general solution of the differential equations:

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

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EXERCISE 9.6 - Question No. 11

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

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EXERCISE 9.6 - Question No. 12

Find the general solution of the differential equations:

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

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EXERCISE 9.6 - Question No. 13

The differential equations, find a particular solution satisfying the given condition: $\frac{dx}{dy} + 2y \tan x = \sin x; y = 0$ when $x = \frac{\pi}{3}$

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EXERCISE 9.6 - Question No. 14

The differential equations, find a particular solution satisfying the given condition: $\left(1 + x^2\right) \frac{dy}{dx} + 2xy = \frac{1}{1 + x^2}; y = 0$ when $x = 1$

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EXERCISE 9.6 - Question No. 15

The differential equations, find a particular solution satisfying the given condition: $\frac{dy}{dx} - 3y \cot x = \sin 2x; y = 2$ when $x = \frac{\pi}{2}$

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EXERCISE 9.6 - Question No. 16

Find the equation of a curve passing through the origin given that the slope of the tangent to the curve at any point (x, y) is equal to the sum of the coordinates of the point.

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EXERCISE 9.6 - Question No. 17

Find the equation of a curve passing through the point (0, 2) given that the sum of the coordinates of any point on the curve exceeds the magnitude of the slope of the tangent to the curve at that point by 5.

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EXERCISE 9.6 - Question No. 18

The Integrating Factor of the differential equation

$x\frac{dy}{dx} - y = 2x^2$ is (A) e^{-x} (B) e^{-y} (C) $\frac{1}{x}$ (D) x

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EXERCISE 9.6 - Question No. 19

The Integrating Factor of the differential equation

$\left(1-y^{2}\right)\frac{dx}{dy}+yx=ay(-1<y<1)$ is (A) $\frac{1}{y^{2}-1}$ (B) $\frac{1}{\sqrt{y^{2}-1}}$ (C) $\frac{1}{1-y^{2}}$ (D) $\frac{1}{\sqrt{1-y^{2}}}$

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MISCELLANEOUS EXERCISE - Question No. 1

For each of the differential equations given below, indicate its order and degree (if defined). (i)

$\frac{d^{2}y}{dx^{2}}+5x\left(\frac{dy}{dx}\right)^{2}-6xy=\log x$ (ii)

$\left(\frac{dy}{dx}\right)^3 - 4\left(\frac{dy}{dx}\right)^2 + 7y = \sin x$ (iii)

$\frac{d^4y}{dx^4} - \sin\left(\frac{d^3y}{dx^3}\right) = 0$

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MISCELLANEOUS EXERCISE - Question No. 2

For each of the exercises given below, verify that the given function (implicit or explicit) is a solution of the corresponding differential equation. (i) $y = ae^x + be^{-x} + x^2$:

$x\frac{d^2y}{dx^2} + 2y\frac{dy}{dx} - xy + x^2 - 2 = 0$ (ii) `y=e^x(acosx+bsin

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MISCELLANEOUS EXERCISE - Question No. 3

Form the differential equation representing the family of curves given by $(x-a)^2+2y^2=a^2$, where a is an arbitrary constant.

MISCELLANEOUS EXERCISE - Question No. 4

Prove that $x^2-y^2=c\left(x^2+y^2\right)^2$ is the general solution of differential equation $\left(x^3-2xy^2\right)dx=\left(y^3-3x^2y\right)dy$, where c is a parameter.

MISCELLANEOUS EXERCISE - Question No. 5

Form the differential equation of the family of circles in the first quadrant which touch the coordinate axes.

MISCELLANEOUS EXERCISE - Question No. 6

Find the general solution of the differential equation

$$\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0 .$$

MISCELLANEOUS EXERCISE - Question No. 7

Show that the general solution of the differential equation

$\frac{dy}{dx} + \frac{y^2 + y + 1}{x^2 + x + 1} = 0$ is given by

$(x + y + 1) = A(1 - x - y - 2xy)$ where A is a parameter

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MISCELLANEOUS EXERCISE - Question No. 8

Find the equation of the curve passing through the point $\left(0, \frac{\pi}{4}\right)$

whose differential equation is $\sin x \cos y dx + \cos x \sin y dy = 0$

.

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MISCELLANEOUS EXERCISE - Question No. 9

Find the particular solution of the differential equation

$(1+e^{2x})dy+(1+y^2)e^x dx=0$, given that

$y=1 when x=0$.

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MISCELLANEOUS EXERCISE - Question No. 10

Solve the differential equation $ye^{\frac{x}{y}}dx=\left(xe^{\frac{x}{y}}+y^2\right)dy(y\neq 0)$

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MISCELLANEOUS EXERCISE - Question No. 11

Find a particular solution of the differential equation

$(x - y)(dx + dy) = dxdy$, given that $y = 1$, when $x = 0$.

(Hint: put $x - y = t$).

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MISCELLANEOUS EXERCISE - Question No. 12

Solve the differential equation

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

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MISCELLANEOUS EXERCISE - Question No. 13

Find a particular solution of the differential equation

$$\frac{dx}{dy} + y\cot x = 1(x \neq 0)4x\cos ecx\ (x \neq 0)\text{ , given that } y = 0$$

when $x = \frac{\pi}{2}$

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MISCELLANEOUS EXERCISE - Question No. 14

Find a particular solution of the differential equation

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

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MISCELLANEOUS EXERCISE - Question No. 15

The population of a village increases continuously at the rate proportional to the number of its inhabitants present at any time. If the population of the village was 20, 000 in 1999 and 25000 in the year 2004, what will be the population of the village in 2009?

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MISCELLANEOUS EXERCISE - Question No. 16

The general solution of the differential equation

$\frac{ydx - xdy}{y} = 0$ is (A) $xy = C$ (B) $x = Cy^2$ (C) $y = Cx$ (D) $y = Cx^2$

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MISCELLANEOUS EXERCISE - Question No. 17

The general solution of a differential equation of the type

$\frac{dx}{dy} + P_1 x = Q_1$ is (A) $ye^{\int P_1 dy} = \int \left(Q_1 e^{\int P_1 dy}\right) dy + C$ (B)

$ye^{\int P_1 dx} = \int \left(Q_1 e^{\int P_1 dx}\right) dx + C$ (C)

$xe^{\int P_1 dy} = \int \left(Q_1 e^{\int P_1 dy}\right) dy + C$ (D)

$xe^{\int p_1 dx} = \int Q_1 e^{\int p_1 dx} dx + C$

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MISCELLANEOUS EXERCISE - Question No. 18

The general solution of the differential equation

$e^x dy + (ye^x + 2x)dx = 0$ is (A) $xe^y + x^2 = C$ (B)

$xe^y + y^2 = C$ (C) $ye^x + x^2 = C$ (D) $ye^y + x^2 = C$

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SOLVED EXAMPLES - Question No. 1

Find the order and degree, if defined, of each of the following differential equations: (i) $\frac{dy}{dx} - \cos x = 0$ (ii) $xy\frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 - y\frac{dy}{dx} = 0$ (iii) $y''' + y^2 + e^{y'} = 0$

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SOLVED EXAMPLES - Question No. 2

Verify that the function $y = e^{-3x}$ is a solution of the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$

SOLVED EXAMPLES - Question No. 3

Verify that the function$y = a\cos x + b\sin x$, where, a, $b \in R$ is a solution of the differential equation $\frac{d^2y}{dx^2} + y = 0$.

SOLVED EXAMPLES - Question No. 4

Form the differential equation representing the family of curves

$y = mx$, where, m is arbitrary constant.

SOLVED EXAMPLES - Question No. 5

Form the differential equation representing the family of curves

$y = as \in (x + b)$, where a, b are arbitrary constants.

SOLVED EXAMPLES - Question No. 6

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

SOLVED EXAMPLES - Question No. 7

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

SOLVED EXAMPLES - Question No. 8

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

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SOLVED EXAMPLES - Question No. 9

Find the general solution of the differential equation

$$\frac{dy}{dx} = \frac{x+1}{2-y}, (y \neq 2)$$

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SOLVED EXAMPLES - Question No. 10

Find the general solution of the differential equation

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

SOLVED EXAMPLES - Question No. 11

Find the particular solution of the differential equation

$$\frac{dy}{dx} = -4xy^2 \text{ given that } y = 1 \text{ , when} x = 0 .$$

SOLVED EXAMPLES - Question No. 12

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

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SOLVED EXAMPLES - Question No. 13

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

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SOLVED EXAMPLES - Question No. 14

In a bank, principal increases continuously at the rate of 5% per year. In how many years Rs 1000 double itself?

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SOLVED EXAMPLES - Question No. 15

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

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SOLVED EXAMPLES - Question No. 16

Show that the differential equation

$x\cos\left(\frac{y}{x}\right)\frac{dy}{dx} = y\cos\left(\frac{y}{x}\right) + x$ is homogeneous and solve it.

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SOLVED EXAMPLES - Question No. 17

Show that the differential equation

$2ye^{\frac{x}{y}}dx + \left(y - 2xe^{\frac{x}{y}}\right)dy = 0$ is homogeneous and find its

particular solution, given that, $x = 0$ when$y = 1$.

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SOLVED EXAMPLES - Question No. 18

Show that the family of curves for which the slope of the tangent at any point (x, y) on it is $\frac{x^2+y^2}{2xy}$, is given by $x^2 - y^2 = cx$.

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SOLVED EXAMPLES - Question No. 19

Find the general solution of the differential equation

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

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SOLVED EXAMPLES - Question No. 20

Find the general solution of the differential equation

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

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SOLVED EXAMPLES - Question No. 21

Find the general solution of the differential equation

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

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SOLVED EXAMPLES - Question No. 22

Find the particular solution of the differential equation

$\frac{dy}{dx} + y \cot x = 2x + x^2 \cot x (x \neq 0)$ given that $y = 0$ when $x = \frac{\pi}{2}$.

SOLVED EXAMPLES - Question No. 23

Find the equation of a curve passing through the point (0, 1). If the slope of the tangent to the curve at any point (x, y) is equal to the sum of the x coordinate (abscissa) and the product of the x coordinate and y coordinate (ordinate) of that point.

SOLVED EXAMPLES - Question No. 24

Verify that the function $y = c_1 e^{ax} \cos bx + c_2 e^{ax} \sin bx$, where c_1, c_2 are arbitrary constants is a solution of the differential equation. $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + (a^2 + b^2)y = 0$

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SOLVED EXAMPLES - Question No. 25

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

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SOLVED EXAMPLES - Question No. 26

Find the particular solution of the differential equation

$\log\left(\frac{dy}{dx}\right) = 3x + 4y$ given that $y = 0$ when $x = 0$.

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SOLVED EXAMPLES - Question No. 27

Solve the differential equation

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

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SOLVED EXAMPLES - Question No. 28

Solve the differential equation $\left(\tan^{-1} y - x\right)dy = \left(1 + y^2\right)dx$

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