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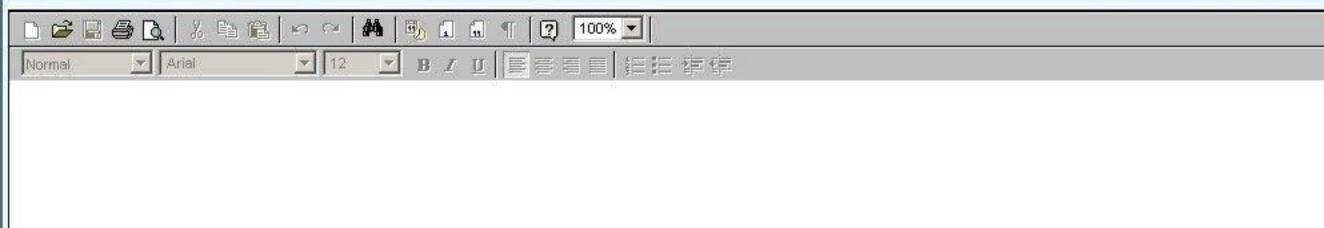
Get All Solutions.

Find the eigenvalues of the following system

$$X' = \begin{pmatrix} 3 & -9 \\ 4 & -3 \end{pmatrix} X$$

Answer (Please <u>click here</u> to Add Answer)

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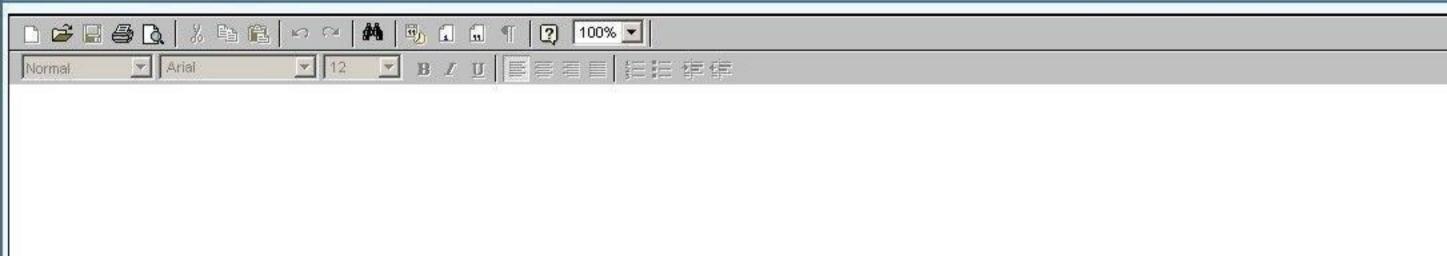


Is generally in matrices following laws hold or not?

- 1- Associative Law
- 2- Distributive Law
- 3- Commutative Law

Answer (Please click here to Add Answer)

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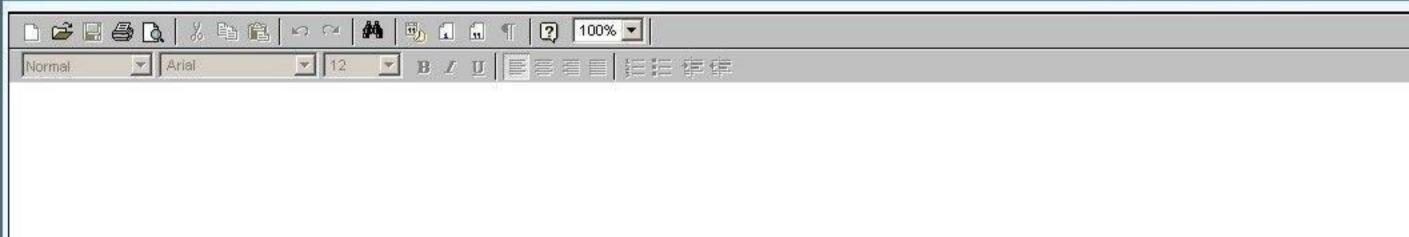


Solve the differential equation:

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

Answer (Please <u>click here</u> to Add Answer)

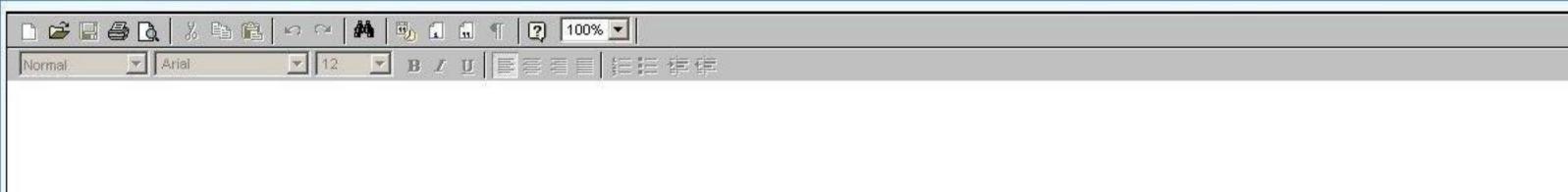
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Find the complementry solution for the DE $y''-4y'+4y=2e^{2x}$?

Answer (Please click here to Add Answer)

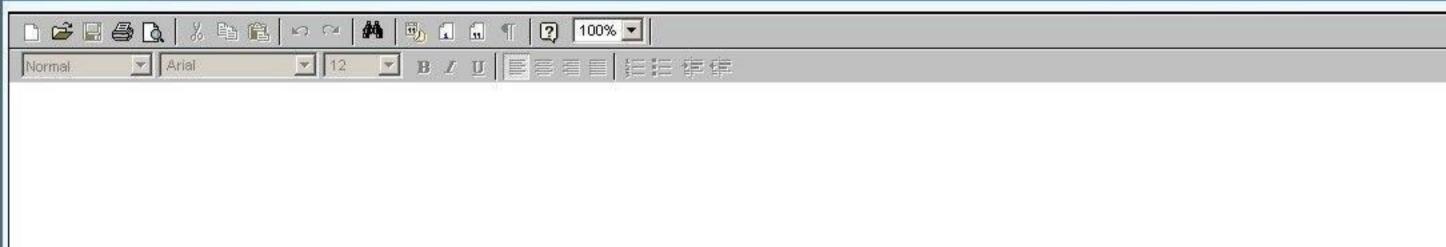
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When roots of indicial equation differ by a positive integer then explain the case when $r_1 = r_2$, where r_1 and r_2 are roots of the indicial equation.

Answer (Please <u>click here</u> to Add Answer)

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State Principal of superposition of set of solution vectors of a homogeneous system.

Answer (Please click here to Add Answer)

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Answer (Please click here to Add Answer)

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Find the general solution of the given differential equation on $(0, \infty)$

$$x^{2}\frac{d^{2}y}{dx^{2}} + x\frac{dy}{dx} + (x^{2} - \frac{1}{64})y = 0$$

Answer (Please <u>click here</u> to Add Answer)

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Write the following system in matirx form

$$\frac{dx}{dt} = x - y + z + t - 1$$
$$\frac{dy}{dt} = 2x + y - z - 3t^{2}$$

$$\frac{dy}{dt} = 2x + y - z - 3t$$

Answer (Please click here to Add Answer)

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What is indicial equation and exponent in the differential equation xy'' + 3y' - y = 0 with x=0 regular singular point?

Answer (Please click here to Add Answer)

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Determine the order and state the linearity of each of the following differential equations.

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

$$2) \quad \frac{dy}{x} - 2xy = x^2 - x$$

Answer (Please click here to Add Answer)

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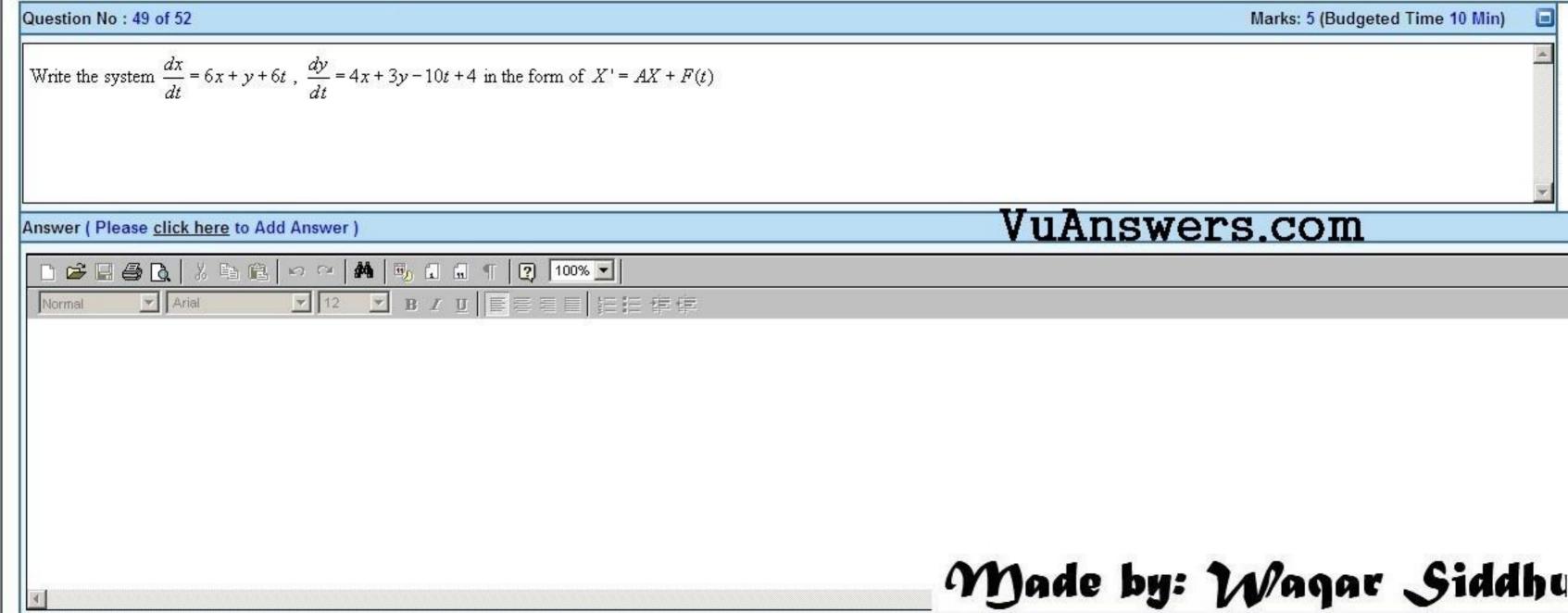






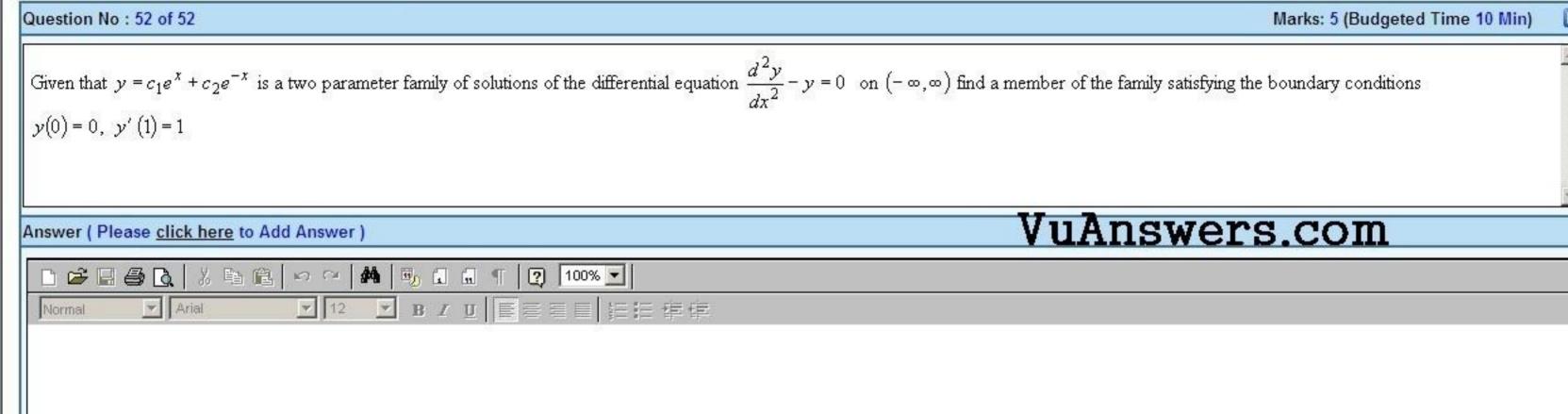










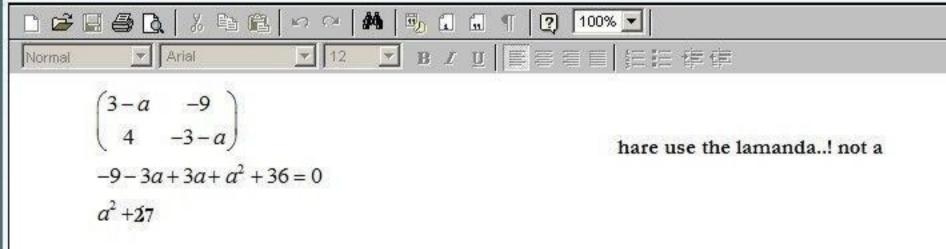


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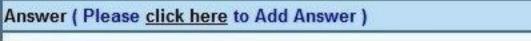
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Is generally in matrices following laws hold or not?

- l Associative Law
- Distributive Law
- Commutative Law



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yes,
$$A + B + C = A + (B + C) = (A + B) + C$$
 (Associative law of addition)

Define regular and irregular singular points?

Answer (Please <u>click here</u> to Add Answer)

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Definition: Regular and Irregular Singular Points

A Singular point $x = x_0$ of the given equation $a_2(x)y'' + a_1(x)y' + a_0(x)y = 0$ is said to be a regular singular point if both $(x - x_0)P(x)$ and $(x - x_0)^2Q(x)$ are analytic at x_0 . A singular point that is not regular is said to be an irregular singular point of the equation.

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

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Answer (Please <u>click here</u> to Add Answer)

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$$2\int y \, dy = \int x^2 \, dx$$
$$y^2 = \frac{x^3}{3} + c$$

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Write down the procedure of solution of the system of differential equations by "Operator Method".

Answer (Please <u>click here</u> to Add Answer)

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☐ This method of solution of a system of linear homogeneous or linear nonhomogeneous differential equations is based on the process of systematic elimination of the dependent variable.

- ☐ This elimination provides us a single differential equation in one of the dependent variables that has not been eliminated
- .
 --->>This equation would be a linear homogeneous or a linear non-homogeneous differential equation and can be solved by employing one of the methods discussed earlier to obtain dependent variables.

Notice that the analogue of multiplying an algebraic equation by a constant is operating on a differential equation with some combination of derivatives.

Find the general solution of the given differential equation on $(0, \infty)$

$$x^{2}\frac{d^{2}y}{dx^{2}} + x\frac{dy}{dx} + (x^{2} - \frac{1}{64})y = 0$$

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Determine the order and state the linearity of each of the following differential equations.

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

$$2) \quad \frac{dy}{x} - 2xy = x^2 - x$$

Answer (Please <u>click here</u> to Add Answer)

Answers to Above Exercises

- 1. order 3, non linear.
- 2. order 1 , linear.
- 3. order 1, non linear.
- 4. order 2 , linear.

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- $(\frac{d^3y}{dx^3})^4 + 2\frac{dy}{dx} = \sin x$
 - $\frac{dy}{dx} 2 x y = x^2 x$
 - $\frac{dy}{dx} \sin y = -x$

solution?

For differential equation x(x-1)y'' + (3x-1)y' + y = 0 if $y_1 = \sum_{k=0}^{\infty} x_k = 1 + x + x^2 + \dots = \frac{1}{1-x}$; $|x| \le 1$

is one solution about regular singularity x = 0, then which method will be use to find 2^{nd}

Answer (Please click here to Add Answer)

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frobenius, i think and.

$$y_2 = y_1(x) \int \frac{e^{-\int P dx}}{y_1^2} dx$$

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Marks: 2 (Budgeted Time 4 Min)

Any two solution vectors X1 and X2 are linearly dependent if and only if one of the two vectors is a constant multiple of the other.

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Answer (Please click here to Add Answer)

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What is Legendre's differential equation

Lecture 34

Legendre's Differential Equation

A second order linear differential equation of the form

$$(1-x^2)y'' - 2xy' + n(n+1)y = 0$$

is called Legendre's differential equation and any of its solution is called Legendre's function. If n is positive integer then the solution of Legendre's differential equation is called a Legendere's polynomial of degree n and is denoted by $P_n(x)$.

We assume a solution of the form $y = \sum_{k} C_k x_k$

$$(1-x^2)y'' - 2xy' + n(n+1)y =$$

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If the complementary solution of the following differential equation is $c_1 \sin 2x + c_2 \cos 2x$, then what will be the general form of its particular solution:

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

Answer (Please click here to Add Answer)

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yp = Asin2x + Bcos2x

y'' + P(x)y' + Q(x)y = 0Can the power series method be directly applied if the coefficients P(x) and Q(x) for the differential equations are not polynomials? If P(x) = Sin x and Q(x) = Cos x, then how we solve it?

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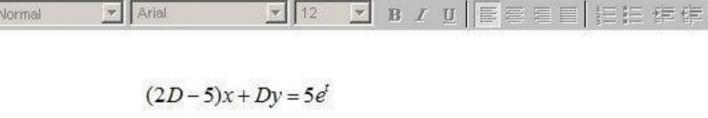
Write the homogenous system of differential equations

$$2\frac{dx}{dt} - 5x + \frac{dy}{dt} = \frac{t}{2}$$
$$\frac{dx}{dt} - x + \frac{dy}{dt} = \frac{t}{2}$$

Answer (Please click here to Add Answer)

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 $(D-1)x + Dy = e^t$

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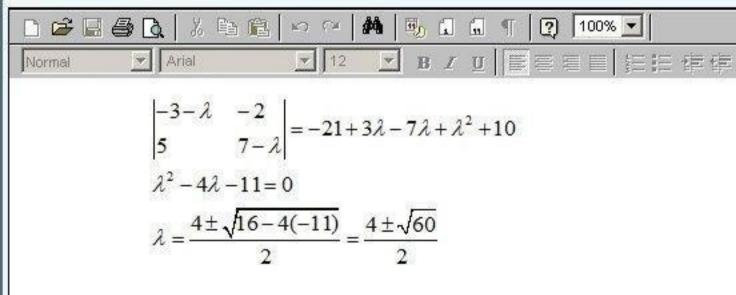
Find the characteristic equation of coefficient matrix of the following system

$$\frac{dx}{dt} = -3x - 2y$$

$$\frac{dy}{dt} = 5x + 7y$$

Answer (Please click here to Add Answer)

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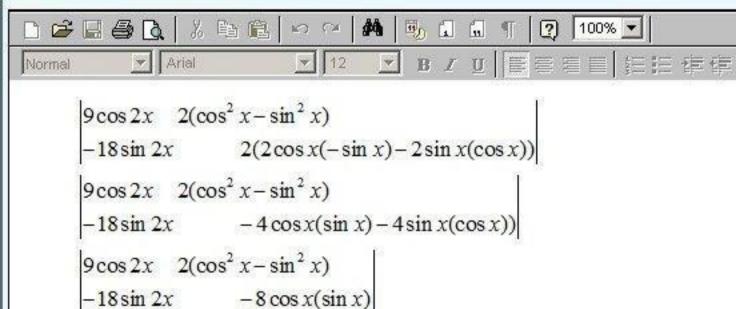


Determine whether the following functions are linearly dependent or linearly Independent?

$$y_1 = 9\cos(2x)$$
, $y_2 = 2\cos^2 x - 2\sin^2 x$

Answer (Please click here to Add Answer)

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 $-8\cos x(\sin x)[9\cos 2x] + 18\sin 2x[2(\cos^2 x - \sin^2 x)]$

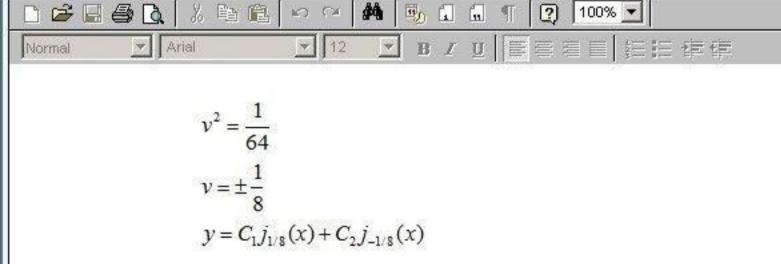
independent

Find the general solution of the given differential equation on $(0, \infty)$

$$x^{2} \frac{d^{2}y}{dx^{2}} + x \frac{dy}{dx} + (x^{2} - \frac{1}{64})y = 0$$

Answer (Please <u>click here</u> to Add Answer)

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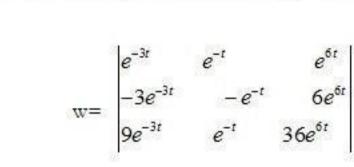


Find the wronskian of the Differential equation $y'''-2y''-21y'-18y=3+4e^{-t}$ using variation of parameter and the root of the auxiliary equation is $m_1=-3$, $m_2=-1$, $m_3=6$?

Answer (Please click here to Add Answer)

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$$w3 = \begin{bmatrix} e^{-3t} & e^{-t} & 0 \\ -2a^{-3t} & -a^{-t} & 0 \end{bmatrix}$$

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Write the following system in matirx form

$$\frac{dx}{dt} = -3x + 4y + e^{-t}\sin 2t$$

$$\frac{dy}{dt} = 5x + 9y + 4e^{-t}\cos 2t$$

Normal

Answer (Please click here to Add Answer)

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$$\begin{bmatrix} \frac{dx}{dt} \\ \frac{dy}{dt} \end{bmatrix} = \begin{bmatrix} -3 & 4 \\ 5 & 9 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} \sin 2t \\ 4\cos 2t \end{bmatrix} e^{-t}$$



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