

⋮ Question

(6 points) 1. Consider a 40-volt electromotive force imposed on an RC-circuit in which the resistance is 4 ohms and the capacitance is $\frac{1}{5}$ farad. If the initial charge on the capacitor is $q(0) = 0$, determine the charge at time t , $q(t)$. Determine the current in the circuit at time t , $i(t)$.

⋮ Question

(6 points) 1. Consider a 60-volt electromotive force imposed on an RC-circuit in which the resistance is 6 ohms and the capacitance is $\frac{1}{5}$ farad. If the initial charge on the capacitor is $q(0) = 0$, determine the charge at time t , $q(t)$. Determine the current in the circuit at time t , $i(t)$.

⋮ Question



(6 points) 2. Suppose a student carrying a flu virus returns to an isolated college campus of 4000 students. If it is assumed that the rate at which the virus spreads is proportional not only to the number x of infected students but also to the number of students not infected, determine the number of infected students after 25 days if it is further observed that after 10 days $x(10)=120$.

⋮ **Question #3** Pick 1 questions, 0 pts per question



⋮ **Question**

3. Two chemicals A and B are combined to form a chemical C . The rate of reaction is proportional to the product of the instantaneous amounts of A and B not converted to chemical C . Initially, there are 60 grams of A and 20 grams of B , and for every 2 grams of B , 3 grams of A are used. It is observed that 10 grams of C are formed in 5 minutes.

(7 points) a. How much of C is formed in 10 minutes?

(2 points) b. What is the limiting amount of C ?

⋮ **Question #4** Pick 1 questions, 0 pts per question



⋮ **Question**

(3 points) 4. Determine if the following set of functions is linearly independent or linearly dependent:

$$f_1(x) = 3x^2 + 2x - 4, f_2(x) = 5x + 1, f_3(x) = 6x^2 + 2$$



⋮ Question

(3 points) 4. Determine if the following set of functions is linearly independent or linearly dependent:

$$f_1(x) = 4x^2 - 3x + 5, f_2(x) = 2x^2 + 4x, f_3(x) = 3x^2 - 1$$

⋮ Question #5 Pick 1 questions, 0 pts per question



⋮ Question

(4 points) 5. Verify that $f_1(x) = x^3$ and $f_2(x) = x^3 \ln x$ form a fundamental set of solutions for the differential equation

$$x^2 - 5xy' + 9y = 0.$$

⋮ Question

(4 points) 5. Verify that $f_1(x) = x^4$ and $f_2(x) = x^4 \ln x$ form a fundamental set of solutions for the differential equation

$$x^2 - 7xy' + 16y = 0.$$

⋮ Question #6 Pick 1 questions, 0 pts per question



⋮ Question



(6 points) 6. Given $y_1(x) = x^{-2}$ is a solution to $x^2y'' + 9xy' + 12y = 0$. Use reduction of order to find $y_2(x)$.

⋮ Question

(6 points) 6. Given $y_1(x) = x^{-2}$ is a solution to $x^2y'' + 7xy' + 8y = 0$. Use reduction of order to find $y_2(x)$.

⋮ Question #7 Pick 1 questions, 0 pts per question



⋮ Question

(4 points) 7. Solve the following differential equation:
 $8y'' - 10y' - 3y = 0$.

⋮ Question

(4 points) 7. Solve the following differential equation:
 $6y'' - 7y' - 3y = 0$.

⋮ Question #8 Pick 1 questions, 0 pts per question



⋮ Question



(4 points) 8. Solve the following differential equation:

$$9y'' - 12y' + 4y = 0.$$

⋮ Question

(4 points) 8. Solve the following differential equation:

$$4y'' - 12y' + 9y = 0.$$

⋮ **Question #9** Pick 1 questions, 0 pts per question



⋮ Question

(4 points) 9. Solve the following differential equation:

$$3y'' + 2y' + 4y = 0.$$

⋮ Question

(4 points) 9. Solve the following differential equation:

$$4y'' + 3y' + 2y = 0.$$

⋮ **Question #10** Pick 1 questions, 0 pts per question



⋮ Question



(4 points) 10. Solve the following differential equation:

$$y''' + 9y'' - 4y' - 36y = 0.$$

⋮ **Question #11** Pick 1 questions, 0 pts per question



⋮ Question

(7 points) 11. Solve the following differential equation by using the superposition method: $y'' - 2y' - 15y = 8e^{5x}$

⋮ Question

(7 points) 11. Solve the following differential equation by using the superposition method: $y'' - 4y' - 12y = 6e^{-2x}$

⋮ **Question #12** Pick 1 questions, 0 pts per question



⋮ Question

(7 points) 12. Solve the following differential equation by using the superposition method: $y'' - 8y' + 12y = 6e^{2x} + 2e^{4x}$

⋮ Question



(7 points) 12. Solve the following differential equation by using the annihilator method: $y'' - 6y' + 8y = 4e^{2x} + 2e^{6x}$

⋮ **Question #13** Pick 1 questions, 0 pts per question



⋮ **Question**

13. State the annihilator operator for the following functions.

(3 points) a. $x^2 e^{4x} + 4x^3$

(3 points) b. $e^{2x} \cos 5x + x e^{3x} \sin 4x$

⋮ **Question**

13. State the annihilator operator for the following functions.

(3 points) a. $x^3 e^{5x} + 6x^2$

(3 points) b. $e^{5x} \sin 2x + x e^{4x} \sin 3x$