Homework1: Problem 43

Prev Up Next

(1 pt) Find the function satisfying the differential equation

$$y' - 4y = 2e^{5t}$$

and $y(0) = -6$.

$y =$ ______ .

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 42

Prev Up Next

(1 pt) Solve the initial value problem

$$\frac{dy}{dt} - y = 9e^{t} + 8e^{5t}$$

with $y(0) = 5$.

$y =$

Preview Answers Check Answers

You have attempted this problem 0 times.

This homework set is closed.

Email instructor

Homework1: Problem 41

Prev Up Next

(1 pt)
Find the general solution to the differential equation

$$y' + 9x^8 y = x^9$$

Use the variable $I = \int e^{x^9}\, dx$ where it occurs in your answer.

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 40

Prev Up Next

(1 pt) Solve the following initial value problem:

$$2\frac{dy}{dt} + y = 4t$$

with $y(0) = 5$.
(Find y as a function of t.)

$y =$.

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework1: Problem 39

Prev Up Next

(1 pt) Solve the following initial value problem:

$$t\frac{dy}{dt} + 4y = 9t$$

with $y(1) = 9$.

$y =$.

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 38

Prev Up Next

(1 pt) Solve the differential equation

$$y' + \frac{9y}{x+7} = (x+7)^2$$

where $y = 2$ when $x = 0$.

$y(x) =$.

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 37

Prev Up Next

(1 pt) Solve the following differential equation. $\frac{dy}{dx} = e^{2x} - 3y$ and $y = 1$ when $x = 0$

$y =$

Hint: Recognize this as a first-order linear differential equation and follow the general method for solving these and use the initial conditions to find the integration constant.

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 36

Prev Up Next

(1 pt) Solve the initial value problem $yy' + x = \sqrt{x^2 + y^2}$ with $y(5) = \sqrt{24}$.

a. To solve this, we should use the substitution

$u =$ help (formulas)

$u' =$ help (formulas)

Enter derivatives using prime notation (e.g., you would enter y' for $\frac{dy}{dx}$).

b. After the substitution from the previous part, we obtain the following linear differential equation in x, u, u'.

help (equations)

c. The solution to the original initial value problem is described by the following equation in x, y.

help (equations)

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

(1 pt) A Bernoulli differential equation is one of the form

$$\frac{dy}{dx} + P(x)y = Q(x)y^n \quad (*)$$

Observe that, if $n = 0$ or 1, the Bernoulli equation is linear. For other values of n, the substitution $u = y^{1-n}$ transforms the Bernoulli equation into the linear equation

$$\frac{du}{dx} + (1-n)P(x)u = (1-n)Q(x).$$

Consider the initial value problem

$$xy' + y = -9xy^2, \quad y(1) = 8.$$

(a) This differential equation can be written in the form $(*)$ with

$P(x) =$,

$Q(x) =$, and

$n =$.

(b) The substitution $u =$ will transform it into the linear equation

$\frac{du}{dx} +$ $u =$.

(c) Using the substitution in part (b), we rewrite the initial condition in terms of x and u:

$u(1) =$.

(d) Now solve the linear equation in part (b). and find the solution that satisfies the initial condition in part (c).

$u(x) =$.

(e) Finally, solve for y.

$y(x) =$

Note: *You can earn partial credit on this problem.*

Homework1: Problem 34

Prev Up Next

(1 pt) Solve the initial value problem $y' = (x + y - 1)^2$ with $y(0) = 0$.

a. To solve this, we should use the substitution

$u =$ help (formulas)

$u' =$ help (formulas)

Enter derivatives using prime notation (e.g., you would enter y' for $\frac{dy}{dx}$).

b. After the substitution from the previous part, we obtain the following differential equation in x, u, u'.

help (equations)

c. The solution to the original initial value problem is described by the following equation in x, y.

help (equations)

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Homework1: Problem 33

Prev Up Next

(1 pt) Find a solution to $\frac{dy}{dx} = xy + 5x + 3y + 15$. If necessary, use k to denote an arbitrary constant.

help (equations)

Preview Answers Check Answers

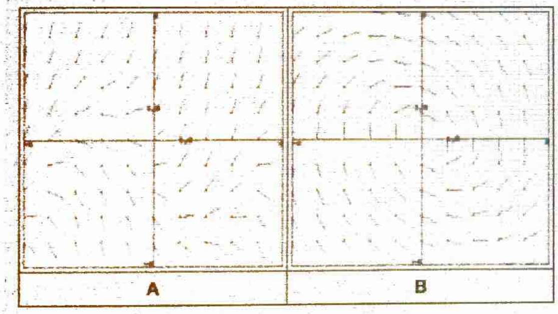
You have attempted this problem 0 times.
This homework set is closed.

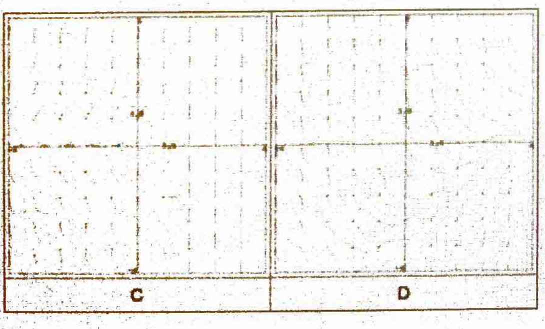
Email instructor

(1 pt) Match the following equations with their direction field. Clicking on each picture will give you an enlarged view. While you can probably solve this problem by guessing, it is useful to try to predict characteristics of the direction field and then match them to the picture. Here are some handy characteristics to start with -- you will develop more as you practice.

A. Set y equal to zero and look at how the derivative behaves along the x-axis.
B. Do the same for the y-axis by setting x equal to 0
C. Consider the curve in the plane defined by setting $y' = 0$ -- this should correspond to the points in the picture where the slope is zero.
D. Setting y' equal to a constant other than zero gives the curve of points where the slope is that constant. These are called isoclines, and can be used to construct the direction field picture by hand.

1. $y' = 2y + x^2 e^{2x}$
2. $y' = -\dfrac{(2x+y)}{(2y)}$
3. $y' = 2\sin(x) + 1 + y$
4. $y' = -2 + x - y$





Homework1: Problem 31

Prev Up Next

(1 pt) A tank contains 100 kg of salt and 1000 L of water. A solution of a concentration 0.05 kg of salt per liter enters a tank at the rate 8 L/min. The solution is mixed and drains from the tank at the same rate.

a.) What is the concentration of our solution in the tank initially?

concentration = (kg/L)

b.) Find the amount of salt in the tank after 3.5 hours.

amount = (kg)

c.) Find the concentration of salt in the solution in the tank as time approaches infinity.

concentration = (kg/L)

Note: *You can earn partial credit on this problem.*

Homework1: Problem 30

Prev Up Next

(1 pt) A tank contains 70 kg of salt and 1000 L of water. Pure water enters a tank at the rate 12 L/min. The solution is mixed and drains from the tank at the rate 6 L/min.

(a) What is the amount of salt in the tank initially?

amount = (kg)

(b) Find the amount of salt in the tank after 1 hours.

amount = (kg)

(c) Find the concentration of salt in the solution in the tank as time approaches infinity. (Assume your tank is large enough to hold all the solution.)

concentration = (kg/L)

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Homework1: Problem 29

Prev Up Next

(1 pt) A tank initially contains 200 gallons of brine, with 50 pounds of salt in solution. Brine containing 2 pounds of salt per gallon is entering the tank at the rate of 4 gallons per minute and is is flowing out at the same rate. If the mixture in the tank is kept uniform by constant stirring, find the amount of salt in the tank at the end of 40 minutes.

The amount of salt in the tank at the end of 40 minutes is ______ pounds.

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 28

Prev Up Next

(1 pt)

Let $y(t)$ be a solution of $\dot{y} = \frac{1}{8}y(1 - \frac{y}{8})$ such that $y(0) = 16$. Determine $\lim_{t\to\infty} y(t)$ without finding $y(t)$ explicitly.

$\lim_{t\to\infty} y(t) =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 27

Prev Up Next

(1 pt)

Determine which differential equation corresponds to each phase line. You should be able to state briefly how you know your choices are correct.

? A B C D E F G H 1. $\frac{dy}{dt} = 3y - y^2$

2. $\frac{dy}{dt} = y^2 - 3y$

3. $\frac{dy}{dt} = y^3 - 4y$

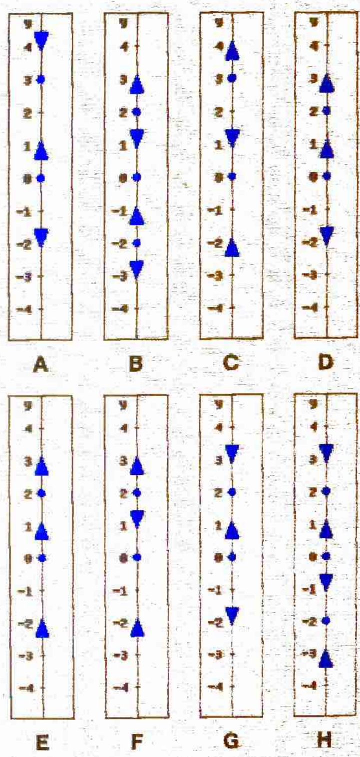
4. $\frac{dy}{dt} = y(y-2)$

5. $\frac{dy}{dt} = y(2-y)^2$

? 6. $\frac{dy}{dt} = y^2 |y-2|$

? 7. $\frac{dy}{dt} = 4y - y^3$

? 8. $\frac{dy}{dt} = 2y - y^2$



Note: *In order to get credit for this problem all answers must be correct.*

Homework1: Problem 26

Prev Up Next

(1 pt) Any population, P, for which we can ignore immigration, satisfies

$$\frac{dP}{dt} = \text{Birth rate} - \text{Death rate}.$$

For organisms which need a partner for reproduction but rely on a chance encounter for meeting a mate, the birth rate is proportional to the square of the population. Thus, the population of such a type of organism satisfies a differential equation of the form

$$\frac{dP}{dt} = aP^2 - bP \quad \text{with } a,\ b > 0.$$

This problem investigates the solutions to such an equation.

(a) Sketch a graph of dP/dt against P. Note when dP/dt is positive and negative.

$dP/dt < 0$ when P is in

$dP/dt > 0$ when P is in

*(Your answers may involve a and b. Give your answers as an interval or list of intervals: thus, if dP/dt is less than zero for P between 1 and 3 and P greater than 4, enter **(1,3),(4,infinity)**.)*

(b) Use this graph to sketch the shape of solution curves with various initial values: use your answers in part (a), and where dP/dt is increasing and decreasing to decide what the shape of the curves has to be. Based on your solution curves, why is $P = b/a$ called the threshold population?

If $P(0) > b/a$, what happens to P in the long run?

$P \to$

If $P(0) = b/a$, what happens to P in the long run?

$P \to$

If $P(0) < b/a$, what happens to P in the long run?

$P \to$

(1 pt) This is part 2 of a two part problem:

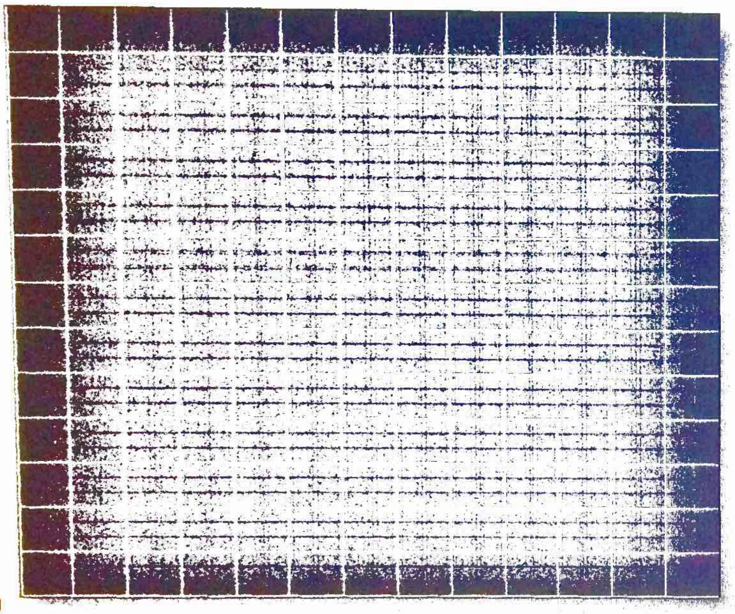
Consider the equation $\frac{dP}{dt} = \left(1 - \frac{P}{11}\right)^3 \left(\frac{P}{8} - 1\right) P^5$, with $P(0) = 7$

(a) Sketch the phase portrait for $P > 0$.

(b) Use the phase portrait for this equation to give a rough sketch of the solution $P(t)$ for $P(0) = 7$ in blue.

Place the cursor over an item to see context sensitive instructions.

13



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SCORE

restore mouse-over help

(c) What happens to $P(t)$ as t gets very large for the solution with initial condition $P(0) = 7$? $\lim_{t\to\infty} P(t) =$

Homework1: Problem 24

Prev Up Next

(1 pt) The following differential equation is exact.
Find a function $F(x, y)$ whose level curves are solutions to the differential equation

$$ydy - xdx = 0$$

$F(x, y) =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 23

Prev Up Next

(1 pt) Find a family of solutions to the differential equation

$$(x^2 - xy)dx + xdy = 0$$

(To enter the answer in the form below you may have to rearrange the equation so that the constant is by itself on one side
solution in implicit form is the set of points (x, y) where

$F(x, y) =$ $\qquad$ $=$ constant

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework1: Problem 22

Prev Up Next

(1 pt) Solve the following differential equation:

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

= constant. help (formulas)

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework1: Problem 21

Prev Up Next

(1 pt) Solve the following differential equation:

$$4x\frac{dy}{dx} = 2xe^x - 4y + 6x^2$$

= constant. help (formulas)

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework1: Problem 20

Prev Up Next

(1 pt) Solve the following differential equation:

$$(y - x^5)dx + (x + y^5)dy = 0$$

= constant. help (formulas)

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 19

Prev Up Next

(1 pt) Solve the following initial value problem:

$$\left(\frac{3y^2 - t^2}{y^5}\right)\frac{dy}{dt} + \frac{t}{2y^4} = 0, \; y(1) = 3.$$

= 0. help (formulas)

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 18

Prev Up Next

(1 pt) Are the following differential equations exact? (You have only one attempt! Submit all answers at the same time)

(a) Choose $\left(1-\frac{3}{y}+x\right)\frac{dy}{dx}+y=\frac{3}{x}-1$.

(b) Choose $(5y-2x)y'-2y=0$.

(c ✓ Choose $\left(2y\sin(x)\cos(x)-y+2y^2e^{xy^2}\right)dx=(x-\sin^2(x)-4xye^{xy^2})dy$.

Exact

Not Exact

No ... artial credit on this problem.

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework1: Problem 18

Prev Up Next

(1 pt) Are the following differential equations exact? (You have only one attempt! Submit all answers at the same time)

(a) Choose $\left(1 - \frac{3}{y} + x\right) \frac{dy}{dx} + y = \frac{3}{x} - 1.$

(b) Choose $(5y - 2x)y' - 2y = 0.$

(c) Choose $\left(2y\sin(x)\cos(x) - y + 2y^2 e^{xy^2}\right) dx = (x - \sin^2(x) - 4xye^{xy^2})dy.$

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework1: Problem 17

Prev Up Next

(1 pt) The differential equation

$$y - 2y^7 = \left(y^3 + 6x\right) y'$$

can be written in differential form:

$$M(x, y)\, dx + N(x, y)\, dy = 0$$

where

$M(x, y) =$, and $N(x, y) =$.

The term $M(x, y)\, dx + N(x, y)\, dy$ becomes an exact differential if the left hand side above is divided by y^7. Integrating that new equation, the solution of the differential equation is $= C$.

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Homework1: Problem 16

Prev Up Next

(1 pt) Use the "mixed partials" check to see if the following differential equation is exact.

If it is exact find a function $F(x, y)$ whose differential, $dF(x, y)$ gives the differential equation. That is, level curves $F(x, y) = C$ are solutions to the differential equation:

$$\frac{dy}{dx} = \frac{2x^2 - 4y}{4x - 4y^2}$$

First rewrite as

$$M(x, y)\, dx + N(x, y)\, dy = 0$$

where $M(x, y) =$,

and $N(x, y) =$.

If the equation is not exact, enter *not exact,* otherwise enter in $F(x, y)$ as the solution of the differential equation here

$= C.$

Note: *You can earn partial credit on this problem.*

Homework1: Problem 15

Prev Up Next

(1 pt) Solve the differential equation

$$\frac{dP}{dt} = 2P + a.$$

Assume a is a non-zero constant, and use C for any constant of integration that you may have in your answer.

$P =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 14

Prev Up Next

(1 pt) Find the solution to the differential equation

$$\frac{dz}{dt} = 9te^{7z}$$

that passes through the origin.

$z =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework1: Problem 13

Prev Up Next

(1 pt) Solve the differential equation

$$\frac{dR}{dx} = a(R^2 + 16).$$

Assume a is a non-zero constant, and use C for any constant of integration that you may have in your answer.

$R =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework1: Problem 12

Prev Up Next

(1 pt)

Find the solution to the differential equation $\frac{dy}{dx} = \frac{4xy}{(\ln y)^2}$ which passes through the point (0,e). Express your answer as

$\ln y =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework1: Problem 11

Prev Up Next

(1 pt) A. Find y in terms of x if

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

and $y(0) = 8$.

$y(x) =$

B. For what x-interval is the solution defined?
(Your answers should be numbers or plus or minus infinity. For plus infinity enter "PINF"; for minus infinity enter "MINF".)

The solution is defined on the interval:

$< x <$

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.

Homework1: Problem 10

Prev Up Next

(1 pt) Find the particular solution of the differential equation

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

satisfying the initial condition $y(3) = \ln(3)$.

$y=$

Your answer should be a function of x.

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework2: Problem 28

Prev Up Next

(1 pt) The function $x^3 e^{4x}$ is annihilated by the operator .

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework2: Problem 27

Prev | Up | Next

(1 pt) The differential operator $(D+2)^3$ is supposed to annihilate the function x^2e^{-2x}, we will check that:

$(D)(x^2e^{-2x}) =$

$(D+2)(x^2e^{-2x}) =$

$D((D+2)(x^2e^{-2x})) =$

$(D+2)^2(x^2e^{-2x}) =$

$D((D+2)^2(x^2e^{-2x})) =$

$(D+2)^3(x^2e^{-2x}) =$

Note: *You can earn partial credit on this problem.*

Preview Answers | Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 26

Prev Up Next

(1 pt) Match the second order linear equations with the Wronskian of (one of) their fundamental solution sets.

1. $y'' - \cos(t)y' + 10y = 0$
2. $y'' + \frac{2}{t}y' + 10y = 0$
3. $y'' + 2y' + 10y = 0$
4. $y'' - 2ty' + 10y = 0$
5. $y'' + \frac{1}{t}y' + 10y = 0$

A. $W(t) = \frac{2}{t}$
B. $W(t) = e^{\sin(t)}$
C. $W(t) = 2e^{-2t}$
D. $W(t) = \frac{5}{t^2}$
E. $W(t) = 3\exp(t^2)$

Note: *You can earn partial credit on this problem.*

Homework2: Problem 25

Prev Up Next

(1 pt) Use the Wronskian to determine whether the functions $y_1 = e^{x+3}$ and $y_2 = e^{x+4}$ are linearly independent.

$$\text{Wronskian} = \det \begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix} = \square$$

The test for linear independence of the set $\{e^{x+3}, e^{x+4}\}$ using the Wronskian is inconclusive because the Wronskian is Choose for all x.

If the functions e^{x+3} and e^{x+4} are linearly dependent, find a nontrivial solution to the equation below. If they are linearly independent, enter all zeros to indicate that the only solution to the equation is the trivial solution.

$$\square (e^{x+3}) + \square (e^{x+4}) = 0.$$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Homework2: Problem 24

Prev Up Next

(1 pt) Are the functions $f, g,$ and h given below linearly independent?

$$f(x) = e^{5x} - \cos(6x), \quad g(x) = e^{5x} + \cos(6x), \quad h(x) = \cos(6x).$$

If they are independent, enter all zeroes. If they are not linearly independent, find a nontrivial solution to the equation below. Be sure you can justify your answer.

$$\_\_\_\left(e^{5x} - \cos(6x)\right) + \_\_\_\left(e^{5x} + \cos(6x)\right) + \_\_\_(\cos(6x)) = 0.$$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework2: Problem 23

Prev Up Next

(1 pt) In this problem you will solve the non-homogeneous differential equation

$$y'' + 64y = \sec^2(8x)$$

(1) Let C_1 and C_2 be arbitrary constants. The general solution to the related homogeneous differential equation $y'' + 64y = 0$ is the function $y_h(x) = C_1\, y_1(x) + C_2\, y_2(x) = C_1$ $+C_2$.

NOTE: The order in which you enter the answers is important; that is, $C_1 f(x) + C_2 g(x) \neq C_1 g(x) + C_2 f(x)$.

(2) The particular solution $y_p(x)$ to the differential equation $y'' + 64y = \sec^2(8x)$ is of the form $y_p(x) = y_1(x)\, u_1(x) + y_2(x)\, u_2(x)$ where $u_1'(x) =$ and $u_2'(x) =$.

(3) It follows that $u_1(x) =$ and $u_2(x) =$; thus $y_p(x) =$.

(4) The most general solution to the non-homogeneous differential equation $y'' + 64y = \sec^2(8x)$ is

$y = C_1$ $+C_2$ $+$.

Note: *You can earn partial credit on this problem.*

Homework2: Problem 22

Prev Up Next

(1 pt)

Find a particular solution to

$$y'' + 2y' + y = \frac{-13e^{-t}}{t^2+1}.$$

$y_p =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 21

Prev Up Next

(1 pt) Find a particular solution to

$$y'' + 25y = 20\sin(5t).$$

$y_p =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 20

Prev Up Next

(1 pt) Find the solution of

$$y'' - 2y' + y = 64\,e^{5t}$$

with $y(0) = 1$ and $y'(0) = 5.$

$y =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 19

Prev | Up | Next

(1 pt) Match the following guess solutions y_p for the *method of undetermined coefficients* with the second-order nonhomogeneous linear equations below.

A. $y_p(x) = Ax^2 + Bx + C$, **B.** $y_p(x) = Ae^{2x}$, **C.** $y_p(x) = A\cos 2x + B\sin 2x$,
D. $y_p(x) = (Ax + B)\cos 2x + (Cx + D)\sin 2x$ **E.** $y_p(x) = Axe^{2x}$, and **F.** $y_p(x) = e^{3x}(A\cos 2x + B\sin 2x)$

1. $\dfrac{d^2y}{dx^2} + 4y = x - \dfrac{x^2}{20}$
2. $\dfrac{d^2y}{dx^2} + 6\dfrac{dy}{dx} + 8y = e^{2x}$
3. $y'' + 4y' + 20y = -3\sin 2x$
4. $y'' - 2y' - 15y = 3x\cos 2x$

Note: *In order to get credit for this problem all answers must be correct.*

Preview Answers | Check Answers

Homework2: Problem 18

Prev Up Next

(1 pt) Let y be the solution of the initial value problem

$$y'' + y = -\sin(2x),\ y(0) = 0, y'(0) = 0.$$

The maximum value of y is

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 17

Prev Up Next

(1 pt) Use the method of undetermined coefficients to solve the following differential equation:

$$y'' + 4y = 4x$$

Answer: $y(x) =$ ______ $+C_1$ ______ $+C_2$ ______ .

NOTE: The order of your answers is important in this problem. For example, webwork may expect the answer "A+B" but the answer you give is "B+A". Both answers are correct but webwork will only accept the former.

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 16

Prev Up Next

(1 pt) Find y as a function of x if

$$x^2y'' - 6xy' - 8y = 0,$$

$y(1) = -10, \quad y'(1) = -1.$

$y =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework2: Problem 15

Prev Up Next

(1 pt) Find y as a function of x if

$$x^2y'' - 15xy' + 64y = x^3,$$

$y(1) = 5, \quad y'(1) = 4.$

$y =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 14

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(1 pt) The general solution to the second-order differential equation $y'' + 11y = 0$ is in the form $y(x) = c_1 \cos \beta x + c_2 \sin \beta x$. Find the value of β, where $\beta > 0$.

Answer: $\beta =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 13

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(1 pt) Find y as a function of x if

$$y^{(4)} - 8y''' + 16y'' = 0,$$

$y(0) = 17, \;\; y'(0) = 5, \;\; y''(0) = 16, \;\; y'''(0) = 0.$

$y(x) =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 12

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(1 pt) The general solution to the second-order differential equation $49y'' + 56y' + 16y = 0$ is in the form $y(x) = c_1 e^{rx} + c_2 x e^{rx}$. Find the value of r.

Answer: $r =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework2: Problem 11

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(1 pt) Solve the following differential equation:

$$y'' + 10y' + 25y = 0$$

Answer: $y(x) = C_1$ $+C_2$.

NOTE: The order of your answers is important in this problem. For example, webwork may expect the answer "A+B" but the answer you give is "B+A". Both answers are correct but webwork will only accept the former.

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework2: Problem 10

Prev Up Next

(1 pt) Find y as a function of x if

$$y''' - 9y'' - y' + 9y = 0,$$

$y(0) = 2, \quad y'(0) = 8, \quad y''(0) = -238.$

$y(x) =$

Preview Answers Check Answers

You have attempted this problem 0 times.

This homework set is closed.

Email Instructor

Homework2: Problem 9

Prev Up Next

(1 pt) Solve the initial-value problem $2y'' + 5y' - 3y = 0$, $y(0) = -1$, $y'(0) = 10$.

Answer: $y(x) =$

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 8

Prev Up Next

(1 pt) Find the two values of k for which $y(x) = e^{kx}$ is a solution of the given differential equation.

$$y'' - 9y' + 14y = 0$$

smaller value =

larger value =

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email Instructor

Homework2: Problem 7

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(1 pt) Find the general solution to the homogeneous differential equation

$$\frac{d^2y}{dt^2} - 7\frac{dy}{dt} = 0$$

The solution can be written in the form

$$y = C_1 e^{r_1 t} + C_2 e^{r_2 t}$$

with

$$r_1 < r_2$$

Using this form, $r_1 =$ ______ and $r_2 =$ ______

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Homework2: Problem 6

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(1 pt)
Find the general solution to the homogeneous differential equation

$$\frac{d^2y}{dt^2} - 0\frac{dy}{dt} - 4y = 0$$

The solution can be written in the form

$$y = C_1e^{r_1t} + C_2e^{r_2t}$$

with

$$r_1 < r_2$$

Using this form, $r_1 =$ and $r_2 =$

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

Homework2: Problem 5

Prev Up Next

(1 pt) You might want to use the solver on your TI-89 for this one. The differential equation $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} - 7\frac{dy}{dx} + 60y = 0$ has auxiliary equation $= 0$

with roots

Note Use m as the variable for your auxiliary equation, the roots you can put in as a comma separated list, the order does not matter.

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

Email instructor

Homework2: Problem 4

Prev Up Next

(1 pt) Match the third order linear equations with their fundamental solution sets.

1. $y''' + y' = 0$
2. $y''' + 3y'' + 3y' + y = 0$
3. $ty''' - y'' = 0$
4. $y''' - 7y'' + 10y' = 0$
5. $y''' - 9y'' + y' - 9y = 0$
6. $y''' - y'' - y' + y = 0$

A. $e^t, \ te^t, \ e^{-t}$
B. $1, \ e^{5t}, \ e^{2t}$
C. $e^{-t}, \ te^{-t}, \ t^2e^{-t}$
D. $1, \ t, \ t^3$
E. $1, \ \cos(t), \ \sin(t)$
F. $e^{9t}, \ \cos(t), \ \sin(t)$

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

Homework2: Problem 3

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(1 pt) The differential equation $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} - 6y = 0$ has auxiliary equation

$= 0$

with roots

Therefore there are two fundamental solutions .

Use these to solve the IVP

$$\frac{d^2y}{dx^2} + 5\frac{dy}{dx} - 6y = 0$$

$$y(0) = -6$$

$$y'(0) = 1$$

$y(x) =$

Note: *You can earn partial credit on this problem.*

Preview Answers Check Answers

You have attempted this problem 0 times.
This homework set is closed.

[redacted]

(1 pt) Consider the DE

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

which is linear with constant coefficients.

First we will work on solving the corresponding homogeneous equation. The auxiliary equation (using m as your variable) is

$= 0$ which has root .

Because this is a repeated root, we don't have much choice but to use the exponential function corresponding to this root: to do reduction of order.

$y_2 = ue^{2x}$

Then (using the prime notation for the derivatives)

$y_2' =$

$y_2'' =$

So, plugging y_2 into the left side of the differential equation, and reducing, we get

$$y_2'' - 4y_2' + 4y_2 =$$

So now our equation is $e^{2x}u'' = x$. To solve for u we need only integrate xe^{-2x} twice, using a as our first constant of integration and b as the second we get

$u =$

Therefore $y_2 =$, the general solution.

We knew from the beginning that e^{2x} was a solution. We have worked out is that xe^{2x} is another solution to the homogeneous equation, which is generally the case when we have multiple roots. Then $\frac{2+2x}{8}$ is the particular solution to the nonhomogeneous equation, and the general solution we derived is pieced together using superposition.

Homework2: Problem 1

Prev Up Next

(1 pt) The differential equation

$$x^2\frac{d^2y}{dx^2} - 7x\frac{dy}{dx} + 16y = 0$$

has x^4 as a solution.
Applying reduction order we set $y_2 = ux^4$.
Then (using the prime notation for the derivatives)

$y_2' =$

$y_2'' =$

So, plugging y_2 into the left side of the differential equation, and reducing, we get

$$x^2y_2'' - 7xy_2' + 16y_2 =$$

The reduced form has a common factor of x^5 which we can divide out of the equation so that we have $xu'' + u' = 0$.
Since this equation does not have any u terms in it we can make the substitution $w = u'$ giving us the first order linear equation $xw' + w = 0$.
This equation has integrating factor for x > 0.

If we use a as the constant of integration, the solution to this equation is $w =$

Integrating to get u, and using b as our second constant of integration we have $u =$

Finally $y_2 =$ and the general solution is

Note: *You can earn partial credit on this problem.*