
Consider the function $f(x,y) = \frac{y^4}{x}$. Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$.

- A. $\frac{\partial f}{\partial x} = \frac{y^4}{x^2}; \quad \frac{\partial f}{\partial y} = \frac{y^4}{x}$
- B. $\frac{\partial f}{\partial x} = -\frac{y^4}{x^2}; \quad \frac{\partial f}{\partial y} = \frac{y^3}{x}$
- C. $\frac{\partial f}{\partial x} = -\frac{4y^3}{x}; \quad \frac{\partial f}{\partial y} = -\frac{4y^3}{x^x}$
- D. $\frac{\partial f}{\partial x} = -\frac{y^4}{x^2}; \quad \frac{\partial f}{\partial y} = \frac{4y^3}{x}$

Consider the first-order differential equation $y' = \frac{y^7}{x}$. Which of the following best describes the regions in the xy-plane for which the differential equation would have a unique solution which passes through a point in the region?

- A. half-plane defined by either $y < 0$ or $y > 0$
- B. the quadrant with $y < 0$ and $x > 0$
- C. half-plane defined by either $x < 0$ or $x > 0$
- D. the quadrant with $x < 0$ and $y > 0$

Consider the first-order differential equation $y' = y^{\frac{2}{7}}$. Which of the following best describes the regions in the xy-plane for which the differential equation would have a unique solution which passes through a point in the region?

- A. half-plane defined by either $x < 0$ or $x > 0$
- B. half-plane defined by either $y < 0$ or $y > 0$
- C. the quadrant with $y < 0$ and $x > 0$
- D. the quadrant with $x < 0$ and $y > 0$

Consider the first-order differential equation $(x+y)y' = y^3$. Which of the following best describes the regions in the xy-plane for which the differential equation would have a unique solution which passes through a point in the region?

- A. the quadrant with $y < 0$ and $x > 0$
- B. half-plane defined by either $y < -x$ or $y > -x$
- C. half-plane defined by either $y < x$ or $y > x$
- D. the quadrant with $x < 0$ and $y > 0$

Consider the first-order differential equation $y' = \ln(y^2 - 4)$. For which point (x_0, y_0) below is it guaranteed that this differential equation has a unique solution at the point (x_0, y_0)?

- A. $(x_0, y_0) = (1, 1)$
- B. $(x_0, y_0) = (1, 3)$
- C. $(x_0, y_0) = (1, 2)$
- D. $(x_0, y_0) = (2, -2)$

Consider the first-order differential equation $y' = \ln(y^2-4)$. For which point (x_0,y_0) below is it guaranteed that this differential equation has a unique solution at the point (x_0,y_0)?

- A. $(x_0,y_0) = (-2,-5)$
- B. $(x_0,y_0) = (5,1)$
- C. $(x_0,y_0) = (0,1)$
- D. $(x_0,y_0) = (1,-2)$

You should verify that $y = \frac{1}{x^2+c}$ is a one-parameter family of solutions for the first-order differential equation $y' = -2xy^2$. Setting $f(x,y) = -2xy^2$ note also that $f(x,y)$ and $\frac{\partial f}{\partial y} = -4xy$ are continous thoughout the entire xy-plane. Thus, for any point (x_0,y_0) in the xy-plane there exists an interval I such that there exists a unique solution which passes through (x_0,y_0).

Find a solution from the family $y = \frac{1}{x^2+c}$ and determine the largest interval I of definition for the solution of for the initial value condition $y(0) = -\frac{1}{9}$.

- A. $y = \frac{1}{x^2+\frac{1}{9}}$; $(-\infty,\infty)$
- B. $y = \frac{1}{x^2-9}$; $(-\infty,-3)$ or $(3,\infty)$
- C. $y = \frac{1}{x^2-9}$; $(-3,3)$
- D. $y = \frac{1}{x^2-3}$; $(-\infty,-3)$ or $(3,\infty)$

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8. (1 point)

You should verify that $y = \frac{1}{x^2+c}$ is a one-parameter family of solutions for the first-order differential equation $y' = -2xy^2$. Setting $f(x,y) = -2xy^2$ note also that $f(x,y)$ and $\frac{\partial f}{\partial y} = -4xy$ are continous thoughout the entire xy-plane. Thus, for any point (x_0,y_0) in the xy-plane there exists an interval I such that there exists a unique solution which passes through (x_0,y_0).

Note, however, that there is no solution from the family $y = \frac{1}{x^2+c}$ which satisfies $y(0) = 0$.

(a) A solution for $y' = -2xy^2$ such that $y(0) = 0$ is $y =$ _____.

(b) The largest interval of definition for y in part (a) is
- Choose
- All real numbers
- All positive real numbers
- All nonnegative real numbers

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9. (1 point)
Solve the differential equation $\frac{dy}{dx} = \cos(5x)$ using separation of variables.

$y =$ ______________ $+C$

[NOTE: Remember to enter all necessary *, (, and) see help (syntax) for more information.]

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10. (1 point)
Solve the differential equation $e^{9x}\,dy + dx = 0$ using separation of variables.

$y =$ ______________ $+C$

[NOTE: Remember to enter all necessary *, (, and) see help (syntax) for more information.]

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11. (1 point) Find the general solution of the differential equation $y' = e^{4x} - 9x$.

(Use C to denote the arbitrary constant.)
$y =$ _________ help (formulas)

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12. (1 point) Find the general solution of the differential equation $x\frac{dy}{dx} = 5y$.

(Use C to denote the arbitrary constant.)
$y =$ _________ help (formulas)

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13. (1 point) Find the equation of the solution to $\frac{dy}{dx} = x^5 y$ through the point $(x,y) = (1,4)$.

(Don't forget to add '$y =$' to your equation!)

______________ help (equations)

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14. (1 point) Find the general solution of the differential equation $\frac{dy}{dx} = e^{2x-9y}$.

(Use C to denote the arbitrary constant.)
$y =$ _________ help (formulas)