

1. (1 point) Select the following which are differential equations.

- A. $y = x$
- B. $y'' + 3$
- C. $s^{(2)} = 5$
- D. $x'' - 2x' + 3x = 0$
- E. $y^3 - y^2 + y = 0$
- F. $y'y = 2$
- G. $\ln(y'') + \sin(y') = e^y$
- H. $\frac{d^2y}{dx^2} - e^x \frac{dy}{dx} + \sin(x) = 2$
- I. $y' = 2y$
- J. None of the above

Solution:

SOLUTION:

The correct answer is CDFGHI.

Correct Answers:

- CDFGHI

2. (1 point)

State what the independent and dependent variables are in the differential equation $y'' + yx = 2x$.

Independent variable: _____

Dependent variable: _____

State what the independent and dependent variables are in the differential equation $\frac{d^2x}{dy} = 15$.

Independent variable: _____

Dependent variable: _____

Solution:

SOLUTION:

For the first differential equation we have its independent variable is x and the dependent variable is y .

For the second differential equation we have its independent variable is y and the dependent variable is x .

Correct Answers:

- x
- y
- y
- x

Which of the following is NOT a correct partial derivative of the 4-variable function $g(x, y, z, w) = x^6 \ln(4y) e^{7z} \cos(4w)$.

- A. $\frac{\partial g}{\partial x} = 6x^5 \ln(4y) e^{7z} \cos(4w)$
- B. $\frac{\partial g}{\partial w} = -4x^6 \ln(4y) e^{7z} \sin(4w)$
- C. $\frac{\partial g}{\partial y} = \frac{x^6 e^{7z} \cos(4w)}{y}$
- D. $\frac{\partial g}{\partial z} = -7x^6 \ln(4y) e^{7z} \sin(4w)$

Solution:

SOLUTION:

The correct answer is D.

Correct Answers:

- D

4. (1 point)

Find the partial derivatives $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ for the function $f(x, y) = \sin(x^9 y^6)$.

$\frac{\partial f}{\partial x} =$ _____ help (formulas)

$\frac{\partial f}{\partial y} =$ _____ help (formulas)

Solution:

SOLUTION:

Using the chain rule, we find

$$\frac{\partial f}{\partial x} = \cos(x^9 y^6) \left(\frac{\partial}{\partial x} (x^9 y^6) \right) = 9x^8 y^6 \cos(x^9 y^6).$$

Meanwhile,

$$\frac{\partial f}{\partial y} = \cos(x^9 y^6) \left(\frac{\partial}{\partial y} (x^9 y^6) \right) = 6x^9 y^5 \cos(x^9 y^6).$$

Correct Answers:

- $9 \cdot x^8 \cdot y^6 \cdot \cos(x^9 y^6)$
- $6 \cdot x^9 \cdot y^5 \cdot \cos(x^9 y^6)$

5. (1 point) Select the following which are ordinary differential equations.

- A. $\frac{d^3 y}{dx^3} - \sin(x) \frac{d^2 y}{dx^2} + \ln(x) = \pi$
- B. $y' - 2y = 3$
- C. $\ln(y'') + e^{y'} = e^y$
- D. $(y')^2 = y$
- E. $\frac{\partial h}{\partial r} + \frac{\partial h}{\partial s} = 5$
- F. $x^{(57)} - 2x''' + 3x = 0$
- G. $\frac{\partial^2 f}{\partial x^2} - \frac{\partial f}{\partial y} = 0$
- H. $y''' + x$
- I. $y^5 + y' = y$
- J. $\frac{df}{dx} + \frac{dg}{dx} = 0$

- K. None of the above

Solution:

SOLUTION:

The correct answer is ABCDFIJ.

Correct Answers:

- ABCDFIJ

6. (1 point) Select the following which are linear differential equations.

- A. $x^{(57)} - 2x''' + 3x = 0$

- B. $\ln(y'') + e^{y'} = e^y$

- C. $\frac{df}{dx} + \frac{dg}{dx} = 0$

- D. $\frac{\partial^2 f}{\partial x^2} - \frac{\partial f}{\partial y} = 0$

- E. $\frac{d^3 y}{dx^3} - \sin(x) \frac{d^2 y}{dx^2} + \ln(x) = \pi$

- F. $y^5 + y' = y$

- G. $y''' + x$

- H. $y' - 2y = 3$

- I. $(y')^2 = y$

- J. $\frac{\partial h}{\partial r} + \frac{\partial h}{\partial s} = 5$

- K. $\frac{\partial h}{\partial r} + \left(\frac{\partial h}{\partial s} \right)^4 = 5$

- L. None of the above

Solution:

SOLUTION:

The correct answer is ACDEHJ.

Correct Answers:

- ACDEHJ

7. (1 point)

$(1-x)y'' - 4xy' + 5y = \cos(x)$	is a	<input type="checkbox"/>	<input type="checkbox"/>	differential equation with
$x \frac{d^3 y}{dx^3} - \left(\frac{dy}{dx} \right)^4 = 0$	is a	<input type="checkbox"/>	<input type="checkbox"/>	differential equation with
$\frac{\partial^2 z}{\partial x^2} + \frac{\partial z}{\partial y} + y = \cos(x+y)$	is a	<input type="checkbox"/>	<input type="checkbox"/>	differential equation with
$\frac{d^2 y}{dx^2} = \sqrt{1 + \left(\frac{dy}{dx} \right)^2}$	is a	<input type="checkbox"/>	<input type="checkbox"/>	differential equation with
$\frac{dy}{dx} = \frac{\cos(y)}{y}$	is a	<input type="checkbox"/>	<input type="checkbox"/>	differential equation with
$\frac{\partial^2 z}{\partial x \partial y} + (xy)^2 = 0$	is a	<input type="checkbox"/>	<input type="checkbox"/>	differential equation with
$y'(1-4t)y + 5y = t$	is a	<input type="checkbox"/>	<input type="checkbox"/>	differential equation with
$y' - (1-y'')y' = t^3 - t$	is a	<input type="checkbox"/>	<input type="checkbox"/>	differential equation with

Correct Answers:

- linear
- ordinary
- 2

- nonlinear
- ordinary
- 3
- linear
- partial
- 2
- nonlinear
- ordinary
- 2
- nonlinear
- ordinary
- 1
- linear
- partial
- 2
- nonlinear
- ordinary
- 1
- nonlinear
- ordinary
- 2

8. (1 point)

State the order of the given differential equations below.

$x^2 \frac{dy}{dx} = 9x$ has order: _____

$\frac{\partial^4 g}{\partial r^4} - e^{r^2 t^3} \frac{\partial^3 g}{\partial y^3} = rt$ has order: _____

$\sin(y^{(7)}) + y' - 3x = 0$ has order: _____

$x^{(6)} = x$ has order: _____

Solution:

SOLUTION:

The orders are 1, 4, 7, and 6, respectively.

Correct Answers:

- 1
- 4
- 7
- 6

9. (1 point)

Determine if the following differential equations are in differential form, normal form, or standard form.

(a) The equation $e^{rs} dr - s ds = 0$ is in

- Choose
- differential
- normal
- standard

form.

(b) The equation $\frac{d^4 f}{dx^4} - e^x \frac{d^2 f}{dx^2} - x = 0$ is in

- Choose
 - differential
 - normal
 - standard
- form.

(c) The equation $y' = y - 3$ is in

- Choose
 - differential
 - normal
 - standard
- form.

(d) The equation $x''' - t^2 x' + x = 0$ is in

- Choose
 - differential
 - normal
 - standard
- form.

(e) The equation $\frac{dg}{ds} = \cos(s)g + s^2$ is in

- Choose
 - differential
 - normal
 - standard
- form.

(f) The equation $x^2 dx + y^2 dy = 0$ is in

- Choose
 - differential
 - normal
 - standard
- form.

Solution:

SOLUTION:

The answers are differential, standard, normal, standard, normal, and differential forms, respectively.

Correct Answers:

- differential
- standard
- normal
- standard
- normal
- differential

10. (1 point)

Enter a value for π

Correct Answers:

- 3.14159