ANSWER on Question #59453 – Math – Differential Equations

QUESTION 4

Find the total differential of the function $u = x^2y - 3y$

a) $2xdx + (x^2 - 3)dy$
b) $2xydx + x^2dy$
c) $2xydx + (x^2 - 3)dy$
d) $2xydx + (x^3 - 2)dy$

SOLUTION

By the definition, for any function $u(x, y)$

$$du = \frac{\partial u}{\partial x}dx + \frac{\partial u}{\partial y}dy$$

In our case

$$u = x^2y - 3y \Leftrightarrow \begin{cases} \dfrac{\partial u}{\partial x} = \dfrac{\partial}{\partial x}(x^2y - 3y) = 2xy \\ \dfrac{\partial u}{\partial y} = \dfrac{\partial}{\partial y}(x^2y - 3y) = x^2 - 3 \end{cases}$$

That is why

$$du = \frac{\partial u}{\partial x}dx + \frac{\partial u}{\partial y}dy = 2xy\,dx + (x^2 - 3)\,dy$$

ANSWER: **c)** $2xy\,dx + (x^2 - 3)\,dy$.

QUESTION 5

The total differential du of a function $u(x, y) = 0$ is defined as

a) $\frac{\partial \mathrm{u}}{\partial \mathrm{x}}dx + \partial \mathrm{u}.\partial x\,dy = 0$
b) $\frac{\partial \mathrm{u}}{\partial x}dy + \frac{\partial u}{\partial y}dy = 0$
c) $\frac{\partial u}{\partial x}dx + \frac{\partial u}{\partial y}dx = 0$
d) $\frac{\partial u}{\partial x}dx + \frac{\partial u}{\partial y}dy = 0$

SOLUTION

$$u(x,y) = 0 \Leftrightarrow d\big(u(x,y)\big) = 0$$

$$du = \frac{\partial u}{\partial x}dx + \frac{\partial u}{\partial y}dy$$

$$du = 0 \Leftrightarrow \frac{\partial u}{\partial x}dx + \frac{\partial u}{\partial y}dy = 0$$

ANSWER : d) $\frac{\partial u}{\partial x}dx + \frac{\partial u}{\partial y}dy = 0.$

QUESTION 6

A differential equation involving only a single independent variable is called ……….. equation.

a) extraordinary differential
b) ordinary differential
c) super-ordinary differential
d) partial differential

SOLUTION

By definition, the differential equation with one independent variable is called an ordinary differential equation

ANSWER : b) ordinary differential.

QUESTION 7

The homogeneous equation $\frac{dy}{dx} = x^4 + x^3y + \frac{y^4}{3x^3y} + y^4$ is of …… degree

a) first
b) second
c) third
d) fourth

SOLUTION

It is an ordinary differential equation, because we see only one independent variable *x* (the derivative is taken with respect to it) and one dependent function *y* (*x*). By definition, the degree of differential equation is determined by the highest derivative.

Therefore, this equation is of first degree.

<u>ANSWER</u> : a) <u>first</u>.