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Application of Integrals by Mathqa22

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Integration and differentiation are the two main operations in calculus, which deals with integrals and derivatives. Thus integrals and derivatives are two basic tools of mathematical calculus. In the later part of the 17th century, Gottfried Leibniz and Isaac Newton independently formulated the integration principles. Some special integrals are also used in trigonometry.

Definition of Integration

Integration in calculus refers to the process of determining i.e. calculating the integral of a function or a variable involved in the function. Integration is an inverse process of differentiation; it is otherwise termed as anti-derivative. The integrals can be chiefly classified as definite integrals and indefinite integrals. The other types of integrals are double integral, line integral, triple integral and surface integral.

Constant of Integration

In closed interval, if there is a function g(y) and its anti-derivative is G(y), we can define the set of all possible anti-derivates of the function g(y) as G(y) + x, for all values of y in the given interval. Here x is an arbitrary constant called as constant of integration. The set of all anti-derivatives of a function g(y) is the indefinite integral of the function. Only the indefinite integral is defined up to the constant of integration. While evaluating definite integrals by applying the fundamental theorem of calculus, the constant of integration cancels with itself.

Application of Integrals

We can see a wide range of application of integrals in science and technology. We can find displacement, velocity, centroid of an area, moments of inertia, all volumes especially volume of solid of revolution, area, position, average value of a curve etc. using integrals.

Area of a curve, area between two curves, area under the curve can be easily found out using integrals. Pressure-Volume graph or PV diagram is usually drawn to show the changes in pressure and volume of a system in various conditions. Under these conditions, with the changing pressure and volume, the area under this curve can be found out by applying the integrals. The total work done as per this graph is computed easily using integrals.

In some cases, an electron that is revolving in an orbit is removed and placed in a higher orbit; the electron gains some potential energy during this change of orbit. By taking the two radii of the orbits through which the electron is shifted as limits, the potential energy of the electron is calculated by applying the integrals.

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The spread of infectious diseases in a selected population can be studied by applying integration process on the differential equations that map the progress of the disease.

Depending on the distance and amount of the electricity charges, the force between the electricity charges will vary. Integration is used to find out the total work done when these charges are separated.

The liquid pressure force varies based on the depth and shape of the object. This force can be calculated using integration i.e. by using integrals.

Listed above are few applications of Integrals. There are a lot more applications of integrals.

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