A COLLECTION Of EXAMPLES Of The APPLICATIONS Of The CALCULUS Of FINITE DIFFERENCES. [bound with] EXA

Problem Statement

The general form of Taylor series is given below.

$$f(x+h) = f(x) + f'(x)h + f''(x)\frac{h^2}{2!} + f'''(x)\frac{h^3}{3!} + f''''(x)\frac{h^4}{4!} + f'''''(x)\frac{h^5}{5!} + \ldots$$

Given

$f(4) = 0$ $f'(4) = 7$ $f''(4) = 10$ $f'''(4) = 30$ and all other higher derivatives of $f(x)$ at $x = 4$ are zero. The function $f(x)$ is of polynomial form,

$$f(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3.$$

Find the function $f(x)$.

Solution

Choosing $x = 4$

$$f(4+h) = f(4) + f'(4)h + f''(4)\frac{h^2}{2!} + f'''(4)\frac{h^3}{3!}$$

as all other higher derivatives are zero.

Substituting the given values of the function and its derivatives at x=4 gives

$$f(4+h) = 0 + 7h + 10\frac{h^2}{2!} + 30\frac{h^3}{3!} = 7h + 5h^2 + 5h^3$$

$$f(4) = 0$$

Using, $h = 1$

$$f(5) = 7(1) + 5(1)^2 + 5(1)^3 = 17$$

Using, $h = 2$

$$f(6) = 7(2) + 5(2)^2 + 5(2)^3 = 74$$

Using, $h = 3$

$$f(7) = 7(3) + 5(3)^2 + 5(3)^3 = 201$$

Now since

$$f(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3$$

then

$$f(4) = 0 = a_0 + a_1 4 + a_2 4^2 + a_3 4^3$$
$$f(5) = 17 = a_0 + a_1 5 + a_2 5^2 + a_3 5^3$$
$$f(6) = 74 = a_0 + a_1 6 + a_2 6^2 + a_3 6^3$$

EXAMPLE 2. Show that the function is a solution to the first-order initial value problem. Solution The equation is a first-order differential equation with ?(x, y) = y .Calculus I (Notes) / Applications of Integrals / Area Between Curves [Notes] [Practice Example 1 Determine the area of the region enclosed by and. Solution Also from this graph it's clear that the upper function will be dependent on the range of Instead we rely on two vertical lines to bound the left and right sides of the.Example 1 Using the definition of the definite integral compute the following. to eliminate the actual summation and get a formula for this for a general n. We can break up definite integrals across a sum or difference. One of the main uses of this property is to tell us how we can integrate a function over (a) [Solution].22 Sep - 7 min By integrating the difference of two functions, you can find the area between them. Prepare.Learn integral calculus for freeindefinite integrals, Riemann sums, definite integrals, application problems, and more. Full curriculum Get some practice with 96 different exercises Let us guide Parametric equations, polar coordinates, and vector-valued functions. We are used Function as a geometric series: Series.Calculus and analysis calculators and examples. Answers for integrals, derivatives, limits, sequences, sums, products, series expansions, vector analysis .A differential equation is a mathematical equation that relates some function with its derivatives. In applications, the functions usually represent physical quantities, the Lagrange solved this problem in and sent the solution to Euler. . In the first group of examples, let u be an unknown function of x, and let c & ? be.Calculus, is the mathematical study of continuous change, in the same way that geometry is Today, calculus has widespread uses in science, engineering, and . the calculus of finite differences developed in Europe at around the same time. . For example, if the doubling function is given the input three, then it outputs.This article provides a practical overview of numerical solutions to the heat equation using the finite difference method. examples considered in this article ?x and ?t are uniform throughout the . Consider a Taylor series expansion ?(x) about the point xi Furthermore, since the function ?(x, t) is also.Algebra   Arithmetic   Calculus   Differential Equations   Discrete Math   Linear Multiple An Intro to Solving Linear Equations: What Does it Mean to be a Solution? for a Polynomial Given: Zeros/Roots, Degree, and One Point Example 3 Find Asymptotes of a Rational Function (Vertical and Oblique/Slant) , Ex 2.rithms. An astonishing variety of finite difference, finite element, finite volume, and cients of the numerical scheme if nonphysical solution behavior is detected. . example, the transport of pollutants in a river is dominated by convection, whereas tation, and testing of numerical methods for advanced CFD applications.In mathematics, a series is, roughly speaking, a description of the operation of adding infinitely many quantities, one after the other, to a given starting quantity. The study of series is a major part of calculus and its generalization, mathematical analysis. Series are used in most areas of mathematics, even for studying finite . If an abelian group A of terms has a concept of limit (for example , if it is a.algebra: a branch of mathematics that uses symbols or letters to represent variables, calculus of variations: an extension of calculus used to search for a function equation with integer coefficients that also allows the variables and solutions to be finite differences: a method of approximating the derivative or slope of a.For example, suppose you wish to integrate a bessel function jv(, x) along the of the integral and the second element holding an upper bound on the error. .. Romberg integration uses the trapezoid rule at step-sizes related by a power of . desired to find the solution to the following second-order differential equation.For example, the computer integration of a function over an interval is accomplished not Numerical analysis is concerned with all aspects of the numerical solution of a . Calculus, in particular, led to accurate mathematical models for physical . Such numerical procedures are often called finite difference methods.Ordinary and partial differential equations occur in many applications. tion but the behaviour of solutions is quite different in general. the unknown function u(x, y) is for example .. follows after integration by parts from the basic lemma of the calculus of of the initial value problem is formally given by a power series.A difference equation involves an integer function f(n) Examples of difference equations often arise in dynamical systems. The solutions to a linear recurrence equation can be computed straightforwardly, be a bound so that a nondegenerate integer recurrence sequence of order n Beyer, W. H. "Finite Differences.numerical analysis of differential equations are tied closely to theoretical behavior and application of differential equations. An excellent book for real world examples of solving differential equations is that of Finite difference methods example, given a function g, the general solution of the simplest equation.