Derivative by first principle calculator

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Find the derivative of f from the first principle, where f is given by

(i) $f(x) = \frac{2x+2}{x+2}$

We need to find Derivative of f(x)

i.e. $f'(x)$

We know that

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

Here, $f(x) = \frac{2x+2}{x+2}$

So, $f(x+h) = \frac{2(x+h)+2}{(x+h)+2}$

- The process of getting the tangent line or gradient at point A on the graph is called the differentiation from the First Principles or differentiation using definition. Thus

$$f'(x) = \frac{dy}{dx} = \lim_{h \to 0}\left[\frac{f(x+h) - f(x)}{h}\right]$$

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b) $f(x) = \frac{-4}{2x+3}$

$$f'(x) = \lim_{h \to 0} \frac{\frac{-4}{2(x+h)+3} - \left(\frac{-4}{2x+3}\right)}{h}$$

$$= \lim_{h \to 0} \frac{-4(2x+3) + 4[2(x+h)+3]}{[2(x+h)+3][2x+3]} \div h$$

$$= \lim_{h \to 0} \frac{-8x-12+8x+8h+12}{[2(x+h)-} \times \frac{1}{h}$$

Derivative of $\frac{1}{x}$ from first principles

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$let\ f(x) = \frac{1}{x}$$

$$f(x+h) = \frac{1}{x+h}$$

$$= \lim_{h \to 0} \frac{\frac{1}{x+h} - \frac{1}{x}}{h}$$

$$= \lim_{h \to 0} \frac{\frac{x}{x(x+h)} - \frac{x+h}{x(x+h)}}{h}$$

Example 20 teachoo.com

Find the derivative of f(x) from the first principle, where f(x) is

(i) sin x + cos x

Given f (x) = sin x + cos x

We need to find Derivative of f(x)

We know that

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

Here,

f (x) = sin x + cos x

f (x + h) = sin (x + h) + cos (x + h)

First rule of derivative. First derivative principle. First derivative using first principle.

Before we find the derivative of sec x, let's remember a few things. sec x is the reciprocal of cos x and tan x is the ratio of sin x to cos x. These definitions of sec x and tan x are very important in distinguishing sec x with respect to x. We can find it in different ways, for example with the first principle, with the relationship rule, with the chain rule. Let's differentiate sec x using each of these methods and solve some problems with sec's derivation. X. What is the derivative of Sec x? The derivative of sec x with respect to x is sec x × tan x. i.e. the product of sec x and tan x. The derivative of sec x with respect to x is d/dx(sec x) (or) (sec x)'. So d/dx (sec x) = sec x tan x (or) (sec x)' = sec x tan x But where does tan x come from in the derivation of sec x? In the following sections we will distinguish between sec x in several ways, e.g. B. by using first principles (definition of the derivative), the partial rule and the chain rule. Basic principles of the derivative of Sec x We will prove that the derivative of Sec x is equal to Sec x · tan x using basic principles (or) of the definition of the derivative. To do this, assume that f(x) = sec x. Proof: According to the first principle, the derivative of f(x) is f'(x) = limâââ [f(x + h) - f(x)] / h... (1) Since f(x) = sec x , then f(x + h) = sec(x + h). Substituting these values into (1), we get f' (x) = lim ââââ [sec (x + h) - sec x]/h = lim ââââ 1/h 1/h [1/(cos (x + h) - 1 /cos x)] = limâââ 1/h [cos x - cos(x + h)] / [cos x cos(x + h)] Summary of product formulas, cos A - cos B = -2 sin (A + B)/2 Sin (A-B)/2. So f'(x) = 1/cos x lim ââ 1/h [- 2 sin (x + x + h)/2 sin (x - x - h)/2] / [cos (x + h)] = 1/cos x limâââ 1/h [- 2 sin (2x + h)/2 sin (- h)/2] / [cos(x + h)] Multiply and divide by h/2, = 1/cos x limâââ (1/h) (h/2) [- 2 sin (2x + h)/2 sin (- h/2) / (h/2)] / [cos(x + h)] If h = 0, with h /2 = 0. So= 1/cos x limâ/ââ sin (h/2) / (h/2). limâ€ (sin(2x + h)/2)/cos(x + h) We have limâââ€ (sin x) / x = 1. So f'(x) = 1/cos x. 1. sin x/cos x We know that 1/cos x = sec x and sin x/cos x = tan x. So f'(x) = sec x Δ tan x Thus proved. Derivation of sec x using the quotient rule We will prove that by differentiating sec x with respect to x we obtain sec x Â tan x using the quotient rule. For this we assume that f(x) = sec x and this can be written as f(x) = 1/cos x Proof: We have f(x) = 1/cos x = u/v by the ratio rule f '(x) = (vu' - uv') / v2 f'(x) = [cos x d/dx(1) - 1 d/dx(cos x)] / (cos x)2 = [cos x (0) - 1 (- sin x)] / cos2x = (sin x) / cos2x = 1/cos x Â (sin x)/(cos x) = sec x Â tan x Thus proved. Derivative of sec x using the chain rule To prove that the derivative of sec x using the chain rule is sec x Â tan x, we assume that f(x) = sec x = 1/cos x. Proof: F(x) can be written as f (x) = 1/cos x = (cos x)-1 From the power and chain rule, f'(x) = (-1) (cos x)-2 d / dx (cos x) From the properties of exponents, a-m = 1/am. We also know that d/dx(cos x) = - sin x. So f'(x) = -1/cos2x Â (- sin x) = (sin x) / cos2x = 1/cos x Â (sin x) /(cos x) = sec x tan x This proves it. Topics related to the derivative of sec x: Here are some topics you might be interested in studying the derivative of sec x: Example 1: What is the derivative of sec x Â tan x? Solution: Let f(x) = sec x Â tan x = uv By product rule f'(x) = uv' + vu' = (sec x) d/dx (tan x) + (tan x) d / dx (sec x) = (sec x) (sec2x) + (tan x) (sec x Â tan x) = sec3x + sec x tan2x Answer: The derivative of the given function is sec3x + sec x tan2x. Example 2: What is the derivative of (sec x)2? Solution: Let f(x) = (s x)2. From the power and chain rule f'(x) = 2 s x d/dx (sec x) = 2 s x Â (sec x Â tan x) = 2 s2x tan x Answer: The derivative of the given function is 2 s2x tan x. Example 3 : Find the derivative of sec-1x. Solution: Let y = s-1x. Then sec y = x ... (1)both sides with respect to x, sec y Â tan y (dy/dx) = 1 dy/dx = 1 / (sec y Â tan y)... (2) According to one of the trigonometric identities, tan y = âsÂy - 1 = âxÂ² - 1 dy/dx = 1/(x âx² - 1) Answer: secÂ¹ derivative of x is 1/(x âx² - 1) . View Answer > Go to SlideGo to SlideGo to Slide Great school learning with simple instructions If learning is haphazard, you can forget concepts. With Cuemath, you will learn visually and be amazed by the results. Book a Free Trial Lesson Derivative of sec x Frequently Asked Questions The derivative of sec x with respect to x is written as d/dx(sec x) and is equal to sec x tan x. i.e. the differentiation of sec x is the product of sec x and tan x. How to find the derivative of § x by first principles? The first principle is used to find the derivative of the function f(x) according to the formula f'(x) = limâââ [f(x + h) - f(x)] / h. Substituting f(x) = sec x and f(x + h) = sec (x + h) into this formula and by simplifying it we can find the derivative sec x sec x tan x. For a more detailed proof, click here. How does Sec x square differ? The square of the second x can be written as f(x) = (sec x)2. By the power and chain law, its derivative is f'(x) = 2 s x d/dx (sec x) = 2 s x (s x tan x) = 2 s2 x tan x. Is the inverse derivative of Sec the same as the derivative of Sec x? No, the derivative of sec x is NOT the same as the derivative of sec-1x. The derivative of sec x is sec x tan x and the derivative of sec-1x is 1/(x â xÂ² - 1). What is the derivative of Sec x²? We know that the derivative of sec w is sec w tan w. Also using the chain rule d/dx (sec x²) = s x² tan x² d/dx(x²) = 2x s x² tan x². What is the derivative of Sec x with respect to Tan x? We need to find d(sec x) / d(tan x). Let sec x = u and tan x = v. Then we need to find du/dv. Now du/dx = sec x tan x and dv/dx = sec²x. Now du/dv = (du/dx) / (dv/dx) = (s x tan x) / (sec²x) = (sec x) / (sec x) = [sin x/cos x]/[1/cos x] =X. Hence the derivative of sec x with respect to tan is sin x. How to prove that the differentiation of Sec x is equal to Sec x Tan x? We can prove that the derivative of sec x is equal to sec x tan x using several methods. You can click any of the following options for more information: We're making WebAssign training easier by improving the instructor experience, including more intuitive site navigation and assignment creation. For more information This article is about the term used in calculations. For a less technical overview of the topic, see Calculus. For other uses, see Conclusion (notation). Instantaneous rate of change (math) A graph of a function drawn in black and a tangent to that graph drawn in red. The slope of the tangent is equal to the derivative of the function at the marked point. Part of a cycle of articles on mathematical analysis. Main clause. Leibniz integral rule. Inverse general Leibniz formula Fa di Reynolds integral Lists of integrals Integral transformation Definitions Antiderivatives Integral (spurious) Riemann integral Lebesgue integration Contour integration Inverse function Integral Subrectangular integration of elements Risch algorithm Series Geometric (arithmetic-geometric) Harmonic AC Tangential Taylor-Omale Convergence criteria Sum and limit (term test) Ratio Square root Integral Direct comparison Limit comparison Variable series Cauchy condensateAbelian Vector Gradient Divergence Laplace Curl Directional Derivation Identities Green Gradient Theorems Generalized Stokes Divergence Stokes Divergence Multidimensional Formalisms Matrix Tensor Extrinsic Geometric Definitions Partial Derivative Multiple Integral Line Integral Area Integral Hess Volume Jacobi Extended Calculus in Euclidean Space History Glossary List of Topics Integration Bee calculus vte In mathematics measures the derivation of a Real variable function The sensitivity to a change in the value of a function (output value) relative to a change in its argument (input value). Derivatives are the main tool of the calculus. For example, the time derivative of a moving object's position is the object's velocity: it measures how quickly the object's position is changing over time. The derivative of a function of one variable given an input value, if any, is the slope of the tangent to the graph of the function at that point. The tangent is the best linear approximation of the function around that input value. For this reason, the derivative is often referred to as the "instantaneous rate of change", which is the ratio of the instantaneous change in the dependent variable to the change in the independent variable. The derivatives can be generalized to functions of several real variables. In this generalization, the derivative is interpreted as a linear transformation whose graph (after appropriate transformation) is the best linear approximation to the graph of the antiderivative. The Jacobian matrix is a matrix that represents this linear transformation with respect to the base given by a selection of independent and dependent variables. This can be calculated using partial derivatives with respect to the independent variables. For functions with real values of several variablesthe matrix is reduced to a gradient vector. The process of finding the derivation is called differentiation. The reverse process is called antidifferentiation. The fundamental theorem of calculus relates anti-differentiation to integration. Differentiation and integration are the two basic operations of single-variable calculus.[Note 1] Definition A real variable function f(x) is differentiable at a point and its domain if its domain contains an open interval I containing a and the limit L = contains lim h â 0 f (a + h) â f (a) h {\displaystyle L=\lim _{h\to 0}{\frac {f(a+h)-f(a)}{ h}} } This means that for every positive real number (even a very small one) there is a positive real number such that for every h such that | h | < н´ {\displaystyle | h |