Derivative Calculator

Calculate derivatives online — *with steps and graphing!*

Calculate the Derivative of ...

theta/2(1+rho*psi*x+sqrt((psix+rho)^2 + (1-p^ Go!

CLR + − × ÷ ^ √ π ( )

This will be calculated:

$$\frac{d}{dx}\left[\frac{\theta}{2}\left(1+\rho\psi x+\sqrt{(\psi x+\rho)^2+1-p^2}\right)\right]$$

Not what you mean? *Use parentheses!* Set differentiation variable and order in "*Options*".

About | **Help** | **Examples** | **Option**

The Derivative Calculator lets you calc of functions online — for free!

Our calculator allows you to check you calculus exercises. It helps you practic the full working (step by step differenti

The Derivative Calculator supports cor second, ..., fifth derivatives as well as d functions with many variables (partial implicit differentiation and calculating can also check your answers! Interacti help visualize and better understand th

For more about how to use the Derivat "*Help*" or take a look at the examples.

And now: Happy differentiating!

Result

Done! See the result further below.
In order to not miss anything, please scroll all the way down.

= Check your own
= Export the expre

YOUR INPUT:

$$f(x) =$$

$$\frac{\theta\left(\sqrt{(\psi x+\rho)^2-p^2+1}+\psi\rho x+1\right)}{2}$$

Note: Your input has been rewritten/simplified.

Simplify | **Roots/zeros**

FIRST DERIVATIVE:

$$\frac{d}{dx}[f(x)] = f'(x) =$$

The steps of calculation are displayed.
Click at any derivative $\frac{d}{dx}[\ldots]$ in order to show the rule that was applied.

$$\frac{\mathrm{d}}{\mathrm{d}x}\left[\frac{\theta\left(\sqrt{(\psi x+\rho)^2-p^2+1}+\psi\rho x+1\right)}{2}\right]$$

$$=\frac{\theta}{2}\left(\frac{\mathrm{d}}{\mathrm{d}x}\left[\sqrt{(\psi x+\rho)^2-p^2+1}\right]+\frac{\mathrm{d}}{\mathrm{d}x}[\psi\rho x]+\frac{\mathrm{d}}{\mathrm{d}x}[1]\right)$$

$$=\frac{\left(\frac{1}{2}\left((\psi x+\rho)^2-p^2+1\right)^{\frac{1}{2}-1}\cdot\frac{\mathrm{d}}{\mathrm{d}x}\left[(\psi x+\rho)^2-p^2+1\right]+\psi\rho\cdot\frac{\mathrm{d}}{\mathrm{d}x}[x]+\right.}{2}$$

$$=\frac{\left(\frac{\frac{\mathrm{d}}{\mathrm{d}x}\left[(\psi x+\rho)^2\right]+\frac{\mathrm{d}}{\mathrm{d}x}\left[-p^2\right]+\frac{\mathrm{d}}{\mathrm{d}x}[1]}{2\sqrt{(\psi x+\rho)^2-p^2+1}}+\psi\rho\cdot 1\right)\theta}{2}$$

$$=\frac{\left(\frac{2(\psi x+\rho)\cdot\frac{\mathrm{d}}{\mathrm{d}x}[\psi x+\rho]+0+0}{2\sqrt{(\psi x+\rho)^2-p^2+1}}+\psi\rho\right)\theta}{2}$$

$$=\frac{\left(\frac{\left(\psi\cdot\frac{\mathrm{d}}{\mathrm{d}x}[x]+\frac{\mathrm{d}}{\mathrm{d}x}[\rho]\right)(\psi x+\rho)}{\sqrt{(\psi x+\rho)^2-p^2+1}}+\psi\rho\right)\theta}{2}$$

$$=\frac{\left(\frac{(\psi\cdot 1+0)(\psi x+\rho)}{\sqrt{(\psi x+\rho)^2-p^2+1}}+\psi\rho\right)\theta}{2}$$

$$=\frac{\theta\left(\frac{\psi(\psi x+\rho)}{\sqrt{(\psi x+\rho)^2-p^2+1}}+\psi\rho\right)}{2}$$

Simplify | Roots/zeros

SECOND DERIVATIVE:

$$\frac{\mathrm{d}^2}{\mathrm{d}x^2}[f(x)]=f''(x)=$$

Note: The result is too wide for the screen. Scroll horizontally to see everything! Move the m
◄ arrows ► appearing on the sides for automatic scrolling (no clicking required

$$\frac{\mathrm{d}}{\mathrm{d}x}\left[\frac{\theta\left(\frac{\psi(\psi x+\rho)}{\sqrt{(\psi x+\rho)^2-p^2+1}}+\psi\rho\right)}{2}\right]$$

$$=\frac{\theta}{2}\left(\frac{\mathrm{d}}{\mathrm{d}x}\left[\frac{\psi\left(\psi x+\rho\right)}{\sqrt{(\psi x+\rho)^2-p^2+1}}\right]+\frac{\mathrm{d}}{\mathrm{d}x}[\psi\rho]\right)$$

$$=\frac{\left(\psi\cdot\frac{\mathrm{d}}{\mathrm{d}x}\left[\frac{\psi x+\rho}{\sqrt{(\psi x+\rho)^2-p^2+1}}\right]+0\right)\theta}{2}$$

$$=\frac{\frac{\frac{\mathrm{d}}{\mathrm{d}x}[\psi x+\rho]\cdot\sqrt{(\psi x+\rho)^2-p^2+1}-(\psi x+\rho)\cdot\frac{\mathrm{d}}{\mathrm{d}x}\left[\sqrt{(\psi x+\rho)^2-p^2+1}\right]}{\left(\sqrt{(\psi x+\rho)^2-p^2+1}\right)^2}\psi\theta}{2}$$

$$=\frac{\left(\left(\psi\cdot\frac{\mathrm{d}}{\mathrm{d}x}[x]+\frac{\mathrm{d}}{\mathrm{d}x}[\rho]\right)\sqrt{(\psi x+\rho)^2-p^2+1}-\frac{1}{2}\left((\psi x+\rho)^2-p^2+1\right)^{\frac{1}{2}-1}\cdot\frac{\mathrm{d}}{\mathrm{d}x}\left[(\right.\right.}{2\left((\psi x+\rho)^2-p^2+1\right)}$$

$$= \frac{\left((\psi \cdot 1 + 0)\sqrt{(\psi x+\rho)^2 - p^2 + 1} - \frac{\left(\frac{d}{dx}\left[(\psi x+\rho)^2\right] + \frac{d}{dx}\left[-p^2\right] + \frac{d}{dx}[1]\right)(\psi x+\rho)}{2\sqrt{(\psi x+\rho)^2 - p^2 + 1}}\right)\psi\theta}{2\left((\psi x+\rho)^2 - p^2 + 1\right)}$$

$$= \frac{\left(\psi\sqrt{(\psi x+\rho)^2 - p^2 + 1} - \frac{\left(2(\psi x+\rho)\cdot\frac{d}{dx}[\psi x+\rho] + 0 + 0\right)(\psi x+\rho)}{2\sqrt{(\psi x+\rho)^2 - p^2 + 1}}\right)\psi\theta}{2\left((\psi x+\rho)^2 - p^2 + 1\right)}$$

$$= \frac{\left(\psi\sqrt{(\psi x+\rho)^2 - p^2 + 1} - \frac{\left(\psi\cdot\frac{d}{dx}[x] + \frac{d}{dx}[\rho]\right)(\psi x+\rho)^2}{\sqrt{(\psi x+\rho)^2 - p^2 + 1}}\right)\psi\theta}{2\left((\psi x+\rho)^2 - p^2 + 1\right)}$$

$$= \frac{\left(\psi\sqrt{(\psi x+\rho)^2 - p^2 + 1} - \frac{(\psi\cdot 1 + 0)(\psi x+\rho)^2}{\sqrt{(\psi x+\rho)^2 - p^2 + 1}}\right)\psi\theta}{2\left((\psi x+\rho)^2 - p^2 + 1\right)}$$

$$= \frac{\psi\theta\left(\psi\sqrt{(\psi x+\rho)^2 - p^2 + 1} - \frac{\psi(\psi x+\rho)^2}{\sqrt{(\psi x+\rho)^2 - p^2 + 1}}\right)}{2\left((\psi x+\rho)^2 - p^2 + 1\right)}$$

Rewrite/simplify:

$$= \frac{\theta\left(\frac{\psi^2}{\sqrt{(\psi x+\rho)^2 - p^2 + 1}} - \frac{\psi^2(\psi x+\rho)^2}{\left((\psi x+\rho)^2 - p^2 + 1\right)^{\frac{3}{2}}}\right)}{2}$$

Simplify/rewrite:

$$-\frac{\left(p^2 - 1\right)\psi^2\theta}{2\left((\psi x+\rho)^2 - p^2 + 1\right)^{\frac{3}{2}}}$$

Simplify | Roots/zeros

NEXT DERIVATIVE:

Calculate next higher derivative

Differentiate last result w. r. t.: p ψ ρ θ

Interactive function graphing:
Navigate using mouse or touch screen. Drag to pan, use the mouse wheel or two fingers to zoom

Toggle
- $f(x$
- $f'($
- $f''($

Assign
- p = 1
- ψ = 1
- ρ = 1
- θ = 1

Support

Did this calculator prove helpful to you? Then I would highly appreciate your support. You're welcome to make a **donation** via PayPal.

Donate

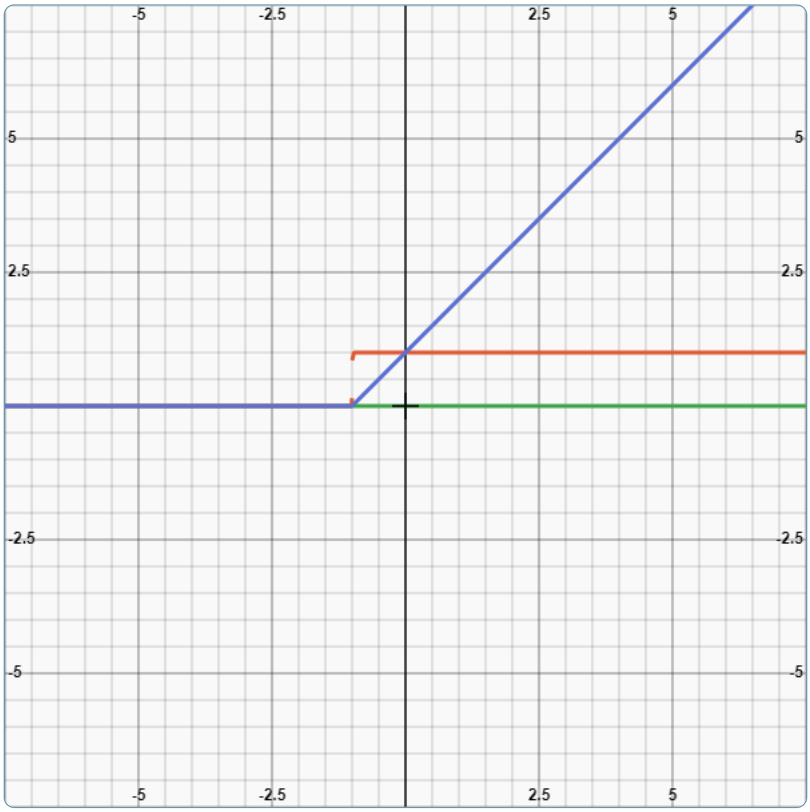


Table o

x

$f(x)$

$f'(x)$

$f''(x)$

Zoom r

XY

Marker at: 0, 0
Click *x* coordinate for table of values.

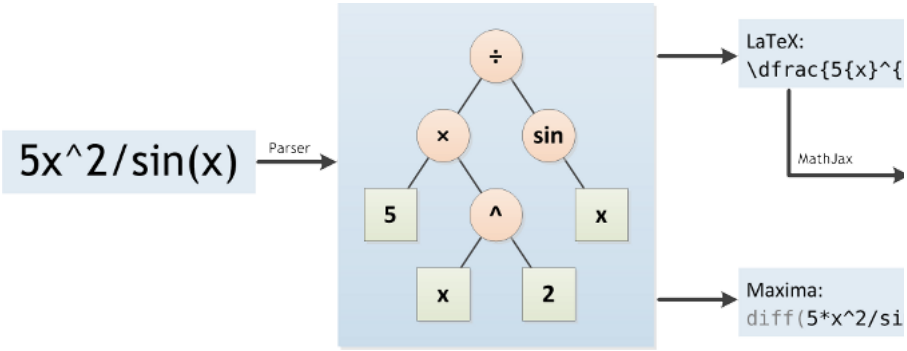
How the Derivative Calculator Works

For those with a technical background, the following section explains how the Derivative Calculato

First, a parser analyzes the mathematical function. It transforms it into a form that is better unders computer, namely a tree (see figure below). In doing this, the Derivative Calculator has to respect t operations. A specialty in mathematical expressions is that the multiplication sign can be left out s example we write "5x" instead of "5*x". The Derivative Calculator has to detect these cases and ins multiplication sign.

The parser is implemented in JavaScript, based on the Shunting-yard algorithm, and can run direct This allows for quick feedback while typing by transforming the tree into LaTeX code. MathJax tak displaying it in the browser.

When the "Go!" button is clicked, the Derivative Calculator sends the mathematical function and th (differentiation variable and order) to the server, where it is analyzed again. This time, the function into a form that can be understood by the computer algebra system Maxima.



Maxima takes care of actually computing the derivative of the mathematical function. Like any cor system, it applies a number of rules to simplify the function and calculate the derivatives accordin known differentiation rules. Maxima's output is transformed to LaTeX again and is then presented

Displaying the steps of calculation is a bit more involved, because the Derivative Calculator can't c on Maxima for this task. Instead, the derivatives have to be calculated manually step by step. The differentiation (product rule, quotient rule, chain rule, ...) have been implemented in JavaScript cod table of derivative functions for the trigonometric functions and the square root, logarithm and exp In each calculation step, one differentiation operation is carried out or rewritten. For example, cons pulled out of differentiation operations and sums are split up (sum rule). This, and general simplifi Maxima. For each calculated derivative, the LaTeX representations of the resulting mathematical e tagged in the HTML code so that highlighting is possible.

The "Check answer" feature has to solve the difficult task of determining whether two mathematic equivalent. Their difference is computed and simplified as far as possible using Maxima. For exam writing trigonometric/hyperbolic functions in their exponential forms. If it can be shown that the di to zero, the task is solved. Otherwise, a probabilistic algorithm is applied that evaluates and compa at randomly chosen places.

The interactive function graphs are computed in the browser and displayed within a canvas eleme each function to be graphed, the calculator creates a JavaScript function, which is then evaluated order to draw the graph. While graphing, singularities (e. g. poles) are detected and treated special control is implemented using Hammer.js.

If you have any questions or ideas for improvements to the Derivative Calculator, don't hesitate to