



The Power of Calculator Software!

# Zoom Math 500

Version 1.00 Upgrade Manual  
for people who used Zoom Math 400

# Zoom Math 500

## Version 1.00 Upgrade Manual

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[www.zoommath.com](http://www.zoommath.com)

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## Upgrading to Zoom500

### New Features in Zoom Math 500

**Zoom Math 500 can solve lots of calculus problems.**

**You can type calculus problems they way they look. For example, to calculate the derivative of  $f(x)$ , you just type  $f'(x)$ . To type the apostrophe, press your calculator's comma key.**

Without a Registration Key, Zoom Math 500 can do all the same things that Zoom Math 400 can do without a Registration Key. After you buy a Registration Key, Zoom Math 500 can solve many Calculus problems. With Zoom Math 500, you can:

- Type calculus problems the way they look, without complicated menus
- Evaluate limits, including one-sided limits and infinite limits
- Use the definition of a derivative to calculate derivatives
- Use formulas and the chain rule to calculate derivatives
- Find the slope of the tangent line at a given point
- Solve related rates
- Evaluate indefinite integrals and definite integrals
- Determine a function, given its derivative and a point
- Integrate by u-substitution

### Installing Zoom Math 500

**If you need help installing Zoom500, visit [zoommath.com](http://zoommath.com).**

If you already installed any other Zoom Math apps on your calculator, then you probably know how to install Zoom Math 500.

Zoom500 is a very large App. Even after you delete Zoom Math 400 from your calculator, you may have to delete another app before you can install Zoom500. You will need at least 114688 ARC FREE to install Zoom500 on your calculator. If you don't know how to delete Apps from your calculator, or if you have any other problem with installation, visit [zoommath.com](http://zoommath.com) for more help, or leave a message at 888-ZOOM-APP.

## Registering Zoom Math 500

**If you already bought Zoom 400 (or Zoom 200 or 300), you will automatically get a discount on Zoom 500.**

To buy a Zoom500 Registration Key, visit [zoommath.com](http://zoommath.com). To buy a Registration Key you will need your calculator's zCode. You can find your calculator's zCode by running Zoom500 and pressing the **ZOOM** key.

Does your calculator already have a registered copy of Zoom Math 200, 300, or 400? If so, then you will automatically get a discount on your Zoom Math 500 Registration Key. You'll see how much your Registration Key costs before you check out.

After you buy a Registration Key, run Zoom500 on your calculator. Go to the main Zoom Math 500 calculations screen and press **ZOOM ENTER**. You will see ten blank spaces where you can type your 10-digit Registration Key. If your registration is successful, you will see a message saying, "Now all the features of Zoom Math 500 are unlocked!"

## New Features in Zoom500

The answers to the examples in this chapter are in exact mode. If you try these examples on your calculator, you might get a decimal answer instead. Just press **MODE** to switch formats.

**To see each step of a solution, press TRACE instead of ENTER.**

Zoom Math 500 can show you the solution to a calculus problem one step at a time. If you want to see each step, then after you type a problem, you should press **TRACE** repeatedly instead of pressing **ENTER**.

All the illustrations in this chapter show what you get if you press **ENTER** to go straight to the answer. None of them show step-by-step solutions.

### Calculating Limits

**To type a limit, press 2nd 1.**

To type a limit in Zoom Math 500, press **2nd 1** (as if you wanted to type L1).

**Zoom Math will assume you want a limit involving  $x$ . If you want a different letter, just go back and type a different letter.**

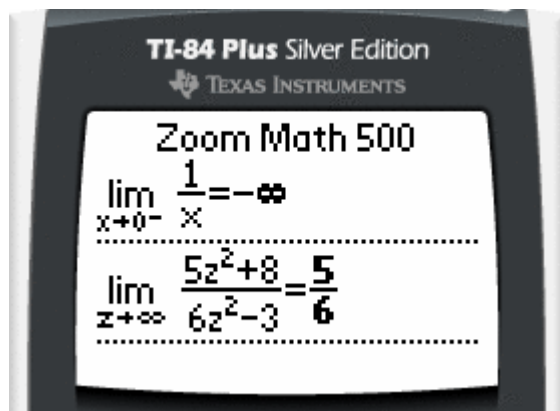
Zoom Math will print  $\lim_{x \rightarrow}$  with the letter  $x$ , without a number. If  $x$  is the right letter, then you can just type a number, and then press **►** to move the cursor out from underneath the limit symbol.

Do you want to type a limit involving a different letter, other than  $x$ ? Press **2nd 1**. Zoom Math will print  $\lim_{x \rightarrow}$  with the letter  $x$  as always; but you can just press **◀** a couple times to go back to the  $x$ , and then type a different letter to replace it. Be careful: If you accidentally delete the arrow underneath the limit sign, then you will have to delete the entire limit and start over.

**To type infinity, press 2nd 8.**

Zoom Math 500 can calculate left-hand limits, right-hand limits, and limits at infinity. To type a raised plus sign or a raised minus sign in a limit, just press the plus key or the minus key. To type an infinity symbol, press **2nd 8**.

Here is an illustration of two limit problems solved by Zoom Math 500:

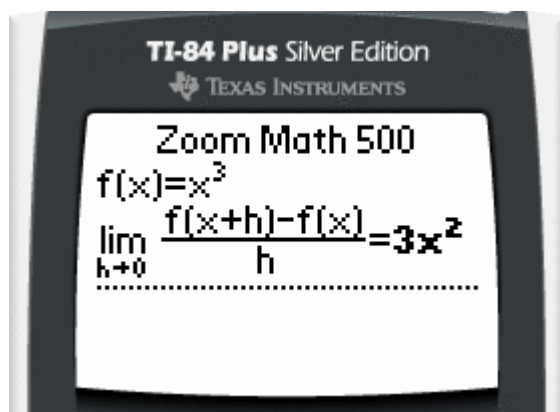


In calculus, the definition of the derivative involves a limit. For any function  $f(x)$ , the function's derivative  $f'(x)$  is defined by the equation:

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

For your convenience, you can quickly type the right side of that equation in Zoom Math by pressing **2nd 1 comma**. (The comma key on your calculator also works as an apostrophe in Zoom Math, so really you are typing limit apostrophe.)

**To quickly type the definition of the derivative of  $f(x)$ , press 2nd 1 and then press the comma.**



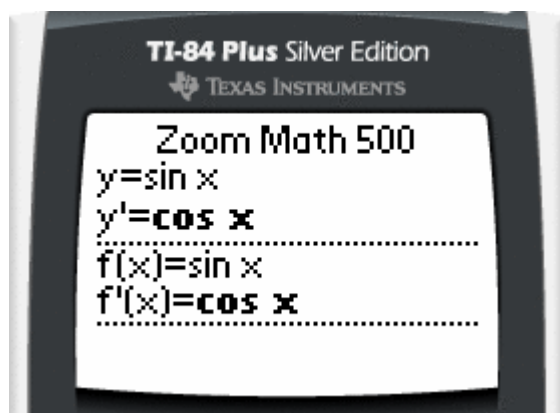
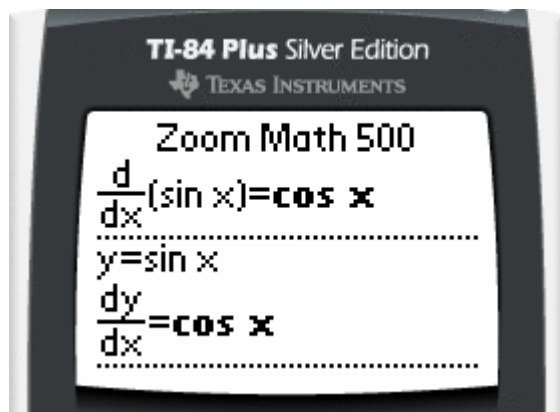
Zoom Math 500 can calculate lots of limits, but you may come across limit problems that Zoom 500 can't handle. For example, Zoom Math does not understand how to simplify some limits that involve trig functions, and Zoom Math does not understand L'Hôpital's Rule for simplifying limits.

## Calculating Derivatives

To type an apostrophe, press the comma key (because it also looks like an apostrophe key).

Zoom Math 500 can calculate derivatives. To type a problem involving a derivative, just type it the way it looks in your textbook. If the problem has an apostrophe, press your calculator's comma key to type the apostrophe.

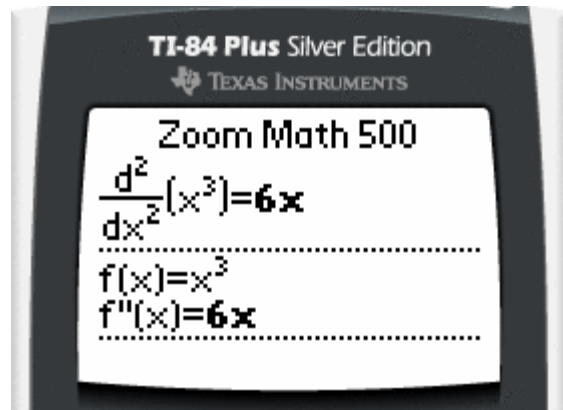
In calculus, there are several different ways to type a derivative. Here are four different ways to tell Zoom Math to calculate the derivative of  $\sin x$ :



(As you can see, the derivative of  $\sin x$  is always  $\cos x$ .)

**Zoom Math 500 can calculate second and third derivatives.**

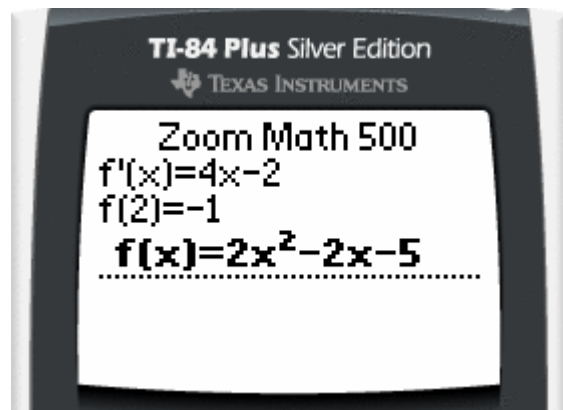
Zoom Math 500 can also calculate second derivatives and higher-order derivatives. Again, just type them the way they look. For example, here are two different ways to tell Zoom Math to calculate the second derivative of  $x^3$ .



Zoom Math 500 is very good at taking derivatives. It understands the Product Rule, the Quotient Rule, the Chain Rule, and so on. However, Zoom Math does not know how to do implicit differentiation, and it does not understand differential equations such as  $dy = 2 dx$ .

If you tell Zoom Math 500 a function, and then you ask for the value of the function's derivative at a certain point, then Zoom Math will calculate that derivative (which is the slope of the tangent line to the function at that point).

If you tell Zoom Math 500 what the derivative of a function is, and then you tell Zoom Math the value of the function at a certain point, then Zoom Math will determine the equation that defines the function.





## Calculating Integrals

**To type an integral, press 2nd comma (as though to type EE).**

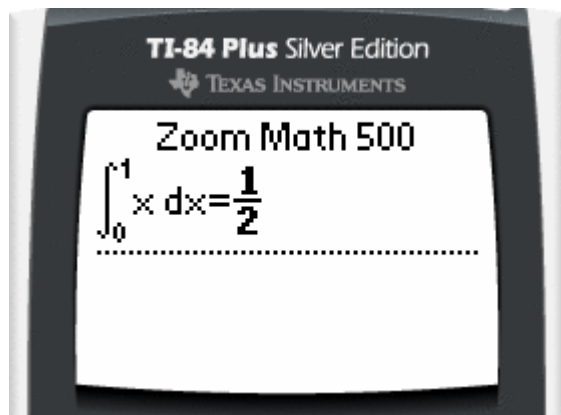
Zoom Math can calculate integrals. In Zoom Math, you often type derivatives using the comma key. An integral is the opposite of a derivative, so in Zoom Math, you can type an integral symbol by pressing 2nd comma.

If you want to type a definite integral, then right after you press 2nd comma, press  $\nabla$ . Zoom Math will move you to the bottom of the integral symbol so you can type a number there. After you type the bottom number, press  $\blacktriangle$  and type the top number. After you type the top number, press  $\blacktriangleright$  to move away from the integral symbol so you can type the rest of the problem.

**At the end of an integral, you need to type dx (or something similar), but you don't need to type a space.**

When you type an integral problem the way it looks in your textbook, you might think you need to type a space before you type  $dx$  (or  $dt$ , or whatever is at the end of the integral). But no, don't worry about it! Just go ahead and press ALPHA D ALPHA X. Zoom Math will automatically add the space for you.

For example, to type  $\int_0^1 x dx$ , press 2nd comma  $\nabla$  0  $\blacktriangle$  1  $\blacktriangleright$  ALPHA X ALPHA D ALPHA X.



Zoom Math 500 can calculate many integrals, including integrals that require  $u$ -substitution. However, Zoom Math 500 may disappoint you sometimes, because it cannot calculate integrals that require advanced techniques. For example, Zoom Math does not solve improper integrals, or integrals that require trig substitutions, or integrals that require integration by parts.

Also, if you show steps of an indefinite integral, Zoom Math might do some strange things involving the constant  $C$ . Someday we hope to improve the way Zoom Math shows steps that involve constants. For now, please don't pay too much attention to the constants! To understand indefinite integrals, just focus on the other parts of the steps that Zoom Math shows you.

## Limitations of Zoom Math 500

**Zoom 500 can solve many beginning calculus problems, but Version 1.00 can't do everything.**

We worked hard to make sure Version 1.00 of Zoom Math 500 can easily solve lots of common, simple calculus problems.

However, there are certain kinds of calculus problems that Zoom Math 500 cannot solve yet:

- Limits of trigonometric functions
- Implicit differentiation
- Derivatives that involve inverse functions
- Differential equations
- Certain related rates problems
- The Second Fundamental Theorem of Calculus
- Integrals that involve polynomial long division
- Hyperbolic functions
- L'Hôpital's Rule
- Integration by parts
- Integration of powers of trig functions
- Trig substitutions
- Improper integrals

(Zoom Math 500's biggest weakness is improper integrals. In some cases, Zoom Math 500 can actually get a wrong answer! But if you are studying for the AP Calculus AB Exam, you don't need to worry about improper integrals. They are only on the BC Exam.)

**Want Zoom 500 to do more? Email us your suggestions.**

We intend to keep working on Zoom Math! If you think of a feature you want us to add to Zoom Math 500, please feel free to send an email to [zhelp@zoommath.com](mailto:zhelp@zoommath.com). When it's time for us to decide what features to work on next, we will look through the list of features that our customers have asked for.

Thank you for using Zoom Math!