



**mathnstuff.com on video**

## **HHCC -- Hand-Held Calculator Calculus**

**Function Storage & Parameters**

**Home Screen Computation**

**Graphing Screen: Computation & Graphing**

**Programs**

**To Compute**

**To Get Ready to Graph**

<http://www.mathnstuff.com/video/video.htm#HHCC>

# Calc Functions in CATALOG & Their Parameters Computation on the Home Screen & in the Y= Menu & in MATH Menu

Calc Functions  
 $nDeriv(\text{function}, \text{variable}, \text{variable of the value}, \text{error})$   
 $fnInt(\text{function}, \text{variable}, \text{from}, \text{to}, \text{tolerance})$

$$\frac{d}{dx} ( ) \Big|_{x=}$$

$$\int ( ) dx$$

off on catalog 0

CATALOG

- fMin(
- ▶fnInt(
- FnOff
- ...
- n/d
- ▶nDeriv(
- ▶n/d◀▶Un/d

NORMAL FLOAT AUT

**CALCULATE**

- 1: value
- 2: zero
- 3: minimum
- 4: maximum
- 5: intersect
- 6: dy/dx
- 7: ∫f(x)dx

test A  
 math  
 matrix D  
 x<sup>-1</sup>

MATH NUM CI

- 1: ▶Frac
- 2: ▶Dec
- 3: 3
- 4: 3√(
- 5: \*√
- 6: fMin(
- 7: fMax(
- 8: nDeriv(
- 9: ↓fnInt(

plot f1 f2 f3 f4  
 y= window zoom trace

Compute the area  
Under a Curve

Y1=X

**CALCULATE**

1:value

2:zero

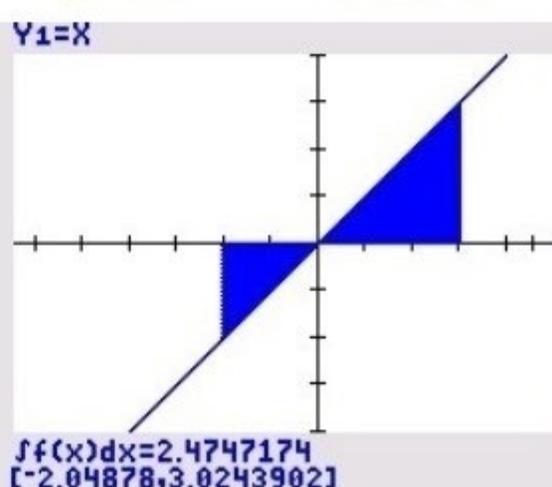
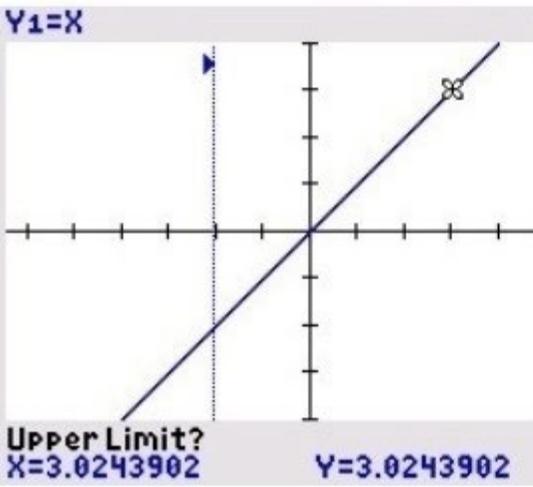
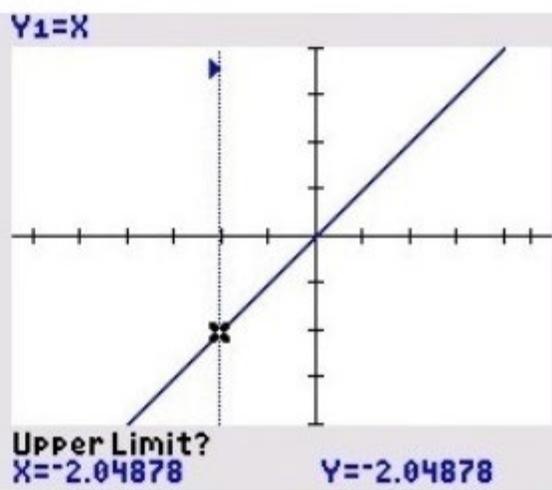
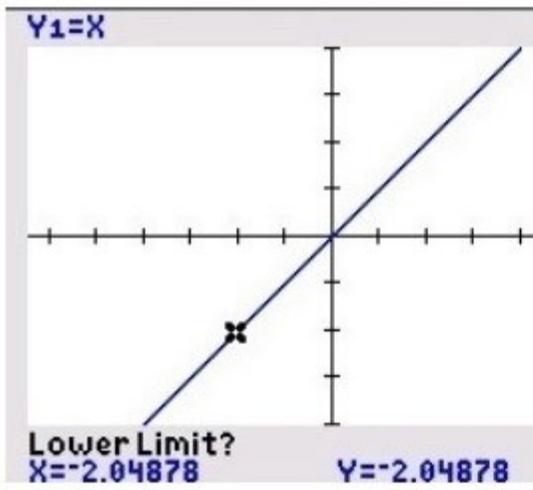
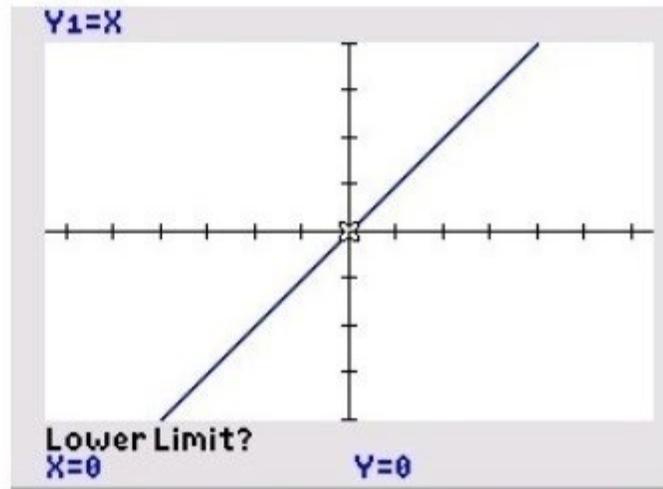
3:minimum

4:maximum

5:intersect

6:dy/dx

7:  $\int f(x) dx$

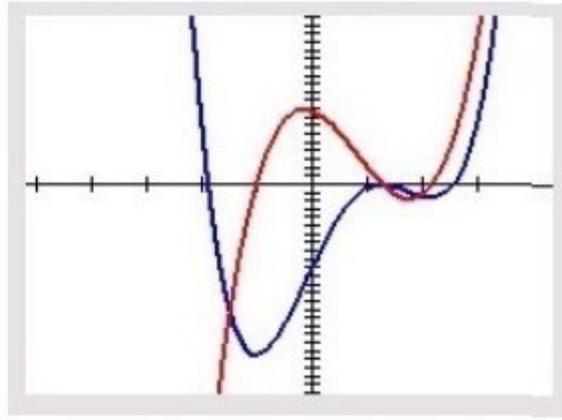
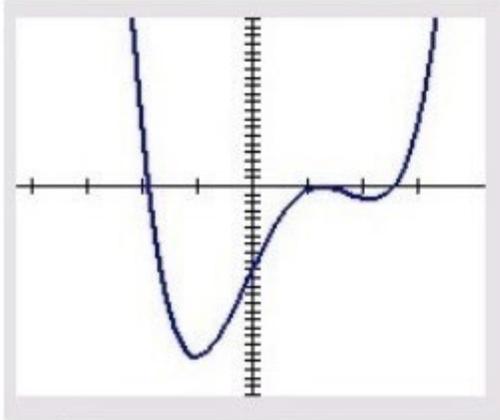


# Calc Functions in the Y= Menu Using nDeriv

nDeriv( function, variable, variable of the value, error)

graph just the function

graph a function & its derivative

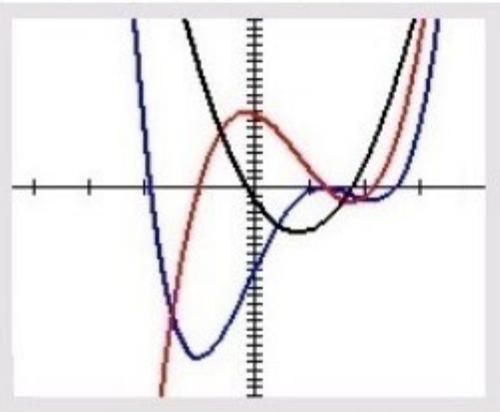


■ \Y1 = 2\*(X+3)\*(X-2)<sup>2</sup>\*(X-4)

■ \Y2 =  $\frac{d}{dX}(Y1)|_{X=X}$

■ \Y3 =  $\frac{d}{dX}(Y2)|_{X=X}$

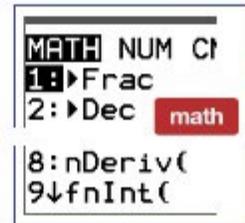
graph f(x), f'(x), f''(x)



Derivative Function in  
CALALOG

use this

nDeriv(  $\frac{d}{dX}(\dots)|_{X=\dots}$



use this



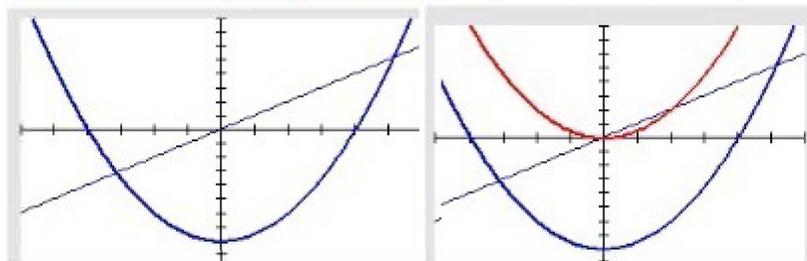
Derivative Function in the  
CALC Menu

do not use this

**CALCULATE** 6: dy/dx

## Graph an Antiderivative

Use CATALOG, or MATH, not CALCULATE



use this



fnInt( function, variable, from, to, tolerance) ▶ fnInt(



A constant of integration is needed.  $Y_2 \equiv \int_{-2}^X (Y_1) dX$

Store what is needed to make the adjustment in C.

X	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>
-4	-4	0	8
-3	-3	-3.5	4.5
-2	-2	-6	2
-1	-1	-7.5	0.5
0	0	-8	0
1	1	-7.5	0.5
2	2	-6	2
3	3	-3.5	4.5
4	4	0	8
5	5	4.5	12.5
6	6	10	18

In this example

$y_1 = x$  and  $f(x) = x$  and

$$F(x) = \int f(x) dx$$

$$F(x) = \frac{x^2}{2} + C$$

Let  $x = 0$  then  $F(0) = \frac{(0)^2}{2} + C$

To make  $F(0) = 0$ , add 8 to  $F(x)$

use 8 as the constant of integration  
and edit  $y_3$  as needed by hand.

It will make  $F(-1) = \frac{1}{2}$  as needed



## Program a TI83

[Find the Characters & the PRGM Menu](#)

[Input Stuff, Do Stuff, Store Stuff, Display Stuff](#)

[Other Programs](#)

["Solve" for e](#)

[Take a "Derivative," Complete a "Definite Integral"](#)

[Put Calc Functions in the Y= Menu](#)

[Run a Program](#)

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## Find the Characters & the PRGM Menu

Sometimes it feels harder to find the keys than to program the calculator.

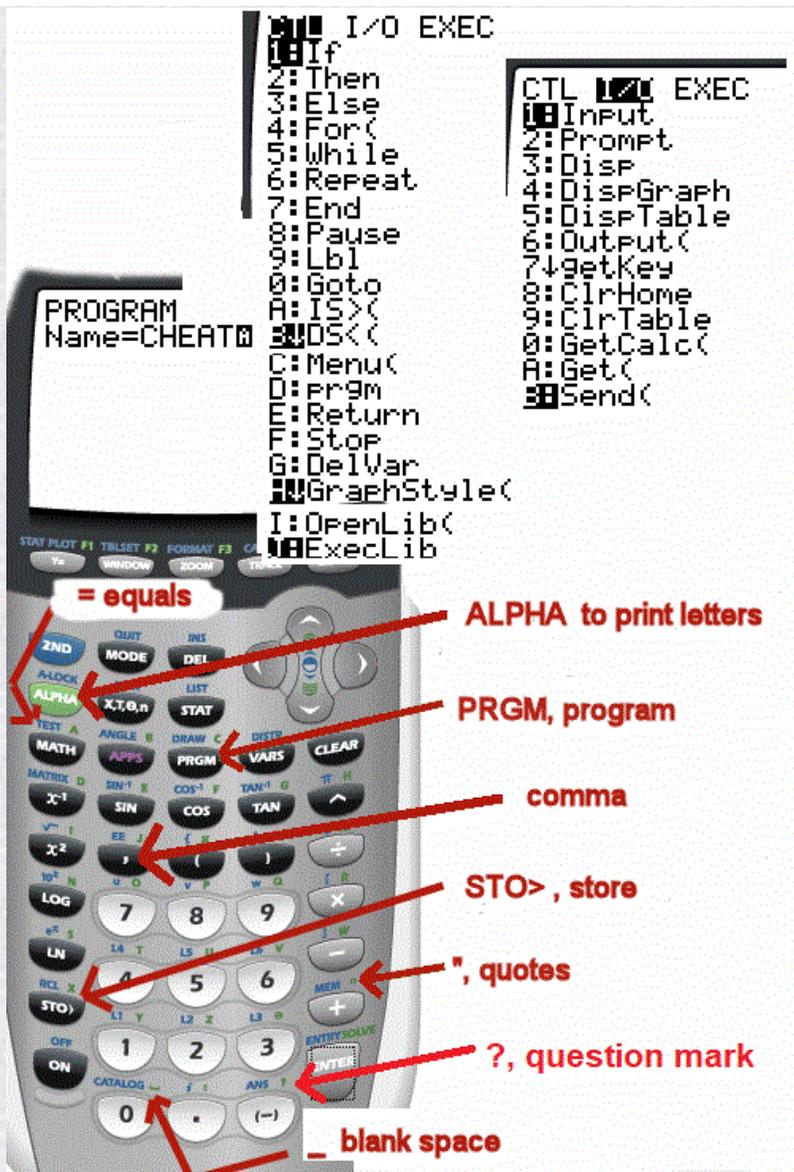
The keys needed most often are the

ALPHA, in green, which serves as a shift to get to the letters and the quote symbol and the PRGM, which is a menu and even when writing the program is used to get to the 3 program menus.

In the picture below, notice how many keys are needed just to produce 1 line of the program.

Again, in the picture below, notice how many times these keys are needed to produce the entire program.

The menus have been organized so the most frequently used keys are at the top of the list.

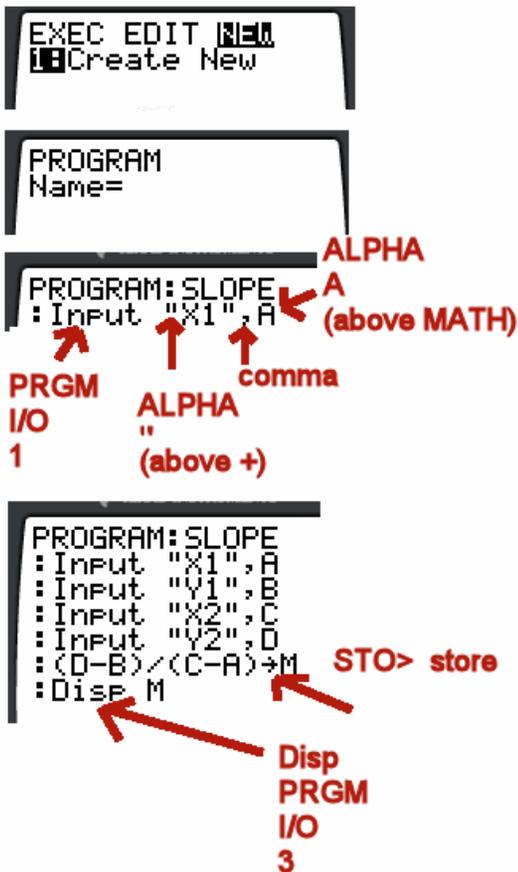


## Input Stuff, Do Stuff, Store Stuff, Display Stuff

To the left, an entire program is displayed. The program computes the slope.

In order to create a program

- 1st: Press PRGM, to get to the program menu.
- 2nd: Curser over to NEW, to edit a new program.



To save the program, QUIT (above MODE).

To run the program, PRGM then scroll down to the program you wish to run, then ENTER, to place the program name on the command line, then ENTER to run the program.

3rd: Type in the name of the program. The ALPHA shift is already set.  
4th: Press enter to store the name and begin writing the first line of the program.

A program is designed to do stuff, but, often this requires the user to input information.

The INPUT command has two forms. For example,

INPUT A

produces a question mark on the calculator screen and sits there until the user inputs a number.

INPUT "prompt", A

gives the user a prompt then, produces a question mark on the calculator screen and sits there until the user inputs a number.

The Disp, display command, has two forms. For example,

Disp A

prints the value of storage location A on the screen.

Disp "prompt"

prints a text message on the screen.

To store a program, Press QUIT, above MODE.

## "HHCC - Hand-Held Calculator Calculus"

```
PROGRAM:VIDEO
:Disp "PUT FX IN Y5"
:Lbl 1
:Disp "DERIV=2"
:Disp "INTEGR=3"
```

This program will compute a derivative where one does not exist. It is using the slope of a secant rather than a tangent.

This calculator is not a CAS machine, a computer algebra system, it does not really integrate or take a derivative.

Notes on the video HHCC.mp4

before writing the program

run the program

write the program

in Catalog above 0

in VARS Function 5:Y5

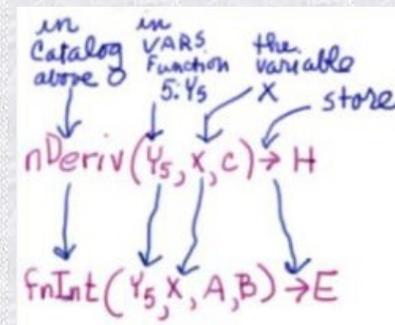
the variable X store

$nDeriv(Y_5, X, C) \rightarrow H$

$fnInt(Y_5, X, A, B) \rightarrow E$

:Input D  
 :If D=3  
 :Goto 3  
 :Lbl 2  
 :Input "AT X=",C  
 :nDeriv(Y<sub>5</sub>,X,C)→ H  
 :Disp H  
 :Goto 1  
 :Lbl 3  
 :Input "A",A  
 :Input "B",B  
 :fnInt(Y<sub>5</sub>,X,A,B) → E  
 :Disp E  
 :Goto 1

This program employs the built-in functions nDeriv and fnInt listed in the catalog (above 0).



Here are the function parameters.  
 nDeriv(function, variable, at this variable value)  
 fnInt(function, variable, lower limit of integration, upper limit of integration)

The function must be stored in the Y= menu, here as Y<sub>5</sub>, because it is not possible to store an expression elsewhere. One may enter and store a new function through the program but one must put quotes around the expression, as in:  
 the function 3x+2  
 must be entered as "3x+2"

- [VIDEO](#) - "HHCC - Hand-Held Calculator Calculus"
- [pdf of this page](#)
- [PAGE - TI83-84 Calculus -- Derivative, Numerical Integration](#)
- [SHEET - Instructions for Calculus through a Graph](#)
- [SHEET - Calc Functions on the HOME SCREEN and in GRAPH](#)

## "Put Calc Functions in the Y= Menu"

```
PROGRAM:PUTFX
:Disp "PUT FX IN Y5"
:Input "C?",C
:Input "A?",A
:Input "B?",B
:"nDeriv(Y5,x,x)"→ Y6
:"nDeriv(Y6,x,x)"→ Y7
:"fnInt(Y5,x,A,x)" → Y8
:"fnInt(Y5,x,A,x) + 2" → Y9
```

Visit

- [PAGE - TI83-84 Calculus -- Derivative, Numerical Integration](#)
- [SHEET - Instructions for Calculus through a Graph](#)
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- [VIDEO](#) - "HHCC - Hand-Held Calculator Calculus"

and notice the derivative and definite integral functions in the Y= menu.

This program stores these functions in Y= so the user need not call the functions from CATALOG each time they are used for graphing. I do not use this program because I do not graph on a calculator. I use Geometer's Sketchpad and the sketches I've written.

My students do not have Sketchpad. They have calculators and the web. I teach them how to program the calculator with the above

program but usually run out of time. This is what is available at mathnstuff.com.

Student resource page and sketchpads

- [Calc Won!](#) - Links and Resources for Students
- [Derivatives Web Page](#)

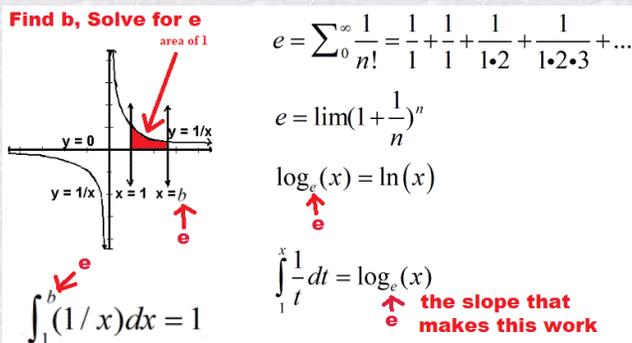
This is what I've been using this semester when teaching calc.

- [Der.Anti.Tool.gsp](#) - current derivatives & antiderivative Sketchpad
- [DerAnyFx.gsp](#) - another current derivatives & antiderivative Sketchpad

Below is a video of some of the Sketchpad use and other Sketch pads available for use.

- [the video of "The Lecture Version of fX.f'X.f''X.intX.gsp -- Limits, Derivatives, Antiderivatives, FTC I, FTC II Presented Dynamically & Analytically](#)
- [fX.f'X.f''X.intX.gsp](#) -- the Sketchpad used in the video listed above.
- [Geometer's Sketchpad Done & Old Stuff & Some Current Stuff Also](#)

## A Program which Permits One to "Solve" for e



Input a values for b which you think makes the area under the curve equal to 1. Click. Repeat as needed until the area is 1. b=

Students who have never studied series or compounding have little background for e, the base of the natural log. This program gives them an introduction without series, compounding, or calc.

In order for the integration to work nicely, a base for the log function must be chosen. There is a number to serve as a base. The ideal base is the number that makes the area drawn at the left in red equal to 1. This program permits one to guess at that number, e. The number e is the base of the natural log,  $\ln(x)$ ,  $\log_e(x)$ .

The calculator program shades the requested area under the curve and completes the computation seeking an area or result equaling 1. See the box at the left.

1st. Store  $1/x$  in  $Y_0$  in the Y= menu.

You may turn off the equal sign if you wish so the function stays stored and not visible in your other graphs.

2nd. Store the following program in the calculator. Locations of key functions and constants are found below.

```
ClrDraw
Disp "Y0 is 1/x"
-.5 STO> Xmin
5 STO> Xmax
-.5 STO> Ymin
5 STO> Ymax
1 STO> Xscl
DrawF Y0
```

```
Line(1,0,1,1)
Pause
Input "e?",D
Shade(0,Y0,1,D)
Pause
fnInt(1/x,x, 1,D) STO> E
Disp E
```

3rd. Run the program.

4th. At the first pause the above image is shown without the shading.

5th. Press [Enter] to continue with the program.

6th. A prompt next requests the guessed solution. Enter the guess.

7th. The requested area is shaded and computed.

8th. Enter another guess or e as desired.

9th. When you are finished with the program use ClrDraw to clear your graphing screen.

- ClrDraw, DrawF, Line, and Shade are found in the Draw menu.
- Xmin, Xmax, Ymin, and Ymax are found in the Var, Window menu.
- fnInt is found in the Calc menu above Trace.
- Shade(lower,higher, leftX,rightX,patterns,patres) and its parameters.
- fnInt(expression,variable, lower,upper,[tolerance]) and its parameters.
- Line(x1,y1,x2,y2) and its parameters.

Take this link to read about ["Exponential/Power Functions,"](#) and ["A Bit about e"](#)

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## Run A Program

To run a program:

Press PRGM, then the number of the program you wish.

This puts the program on the home screen just as any other command.

Press ENTER.

This executes the command to run the program.

In addition to the compute the slope program listed [above](#), another page provides the code for a [Solve Linear Systems Program](#).



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