Graph Solve

You can use any of the following methods to analyze function graphs and approximate results.

- Root extraction
- Determination of the maximum and minimum
- Determination of the y-intercept
- Determination of the intersection of two graphs
- Determination of the coordinates at any point (y for a given x/x for a given y)
- Determination of the integral for any range

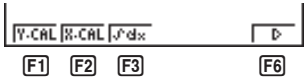
9-1 Before Using Graph Solve

After using the **GRAPH Mode** to draw the graph, press [SHIFT] [F5] (G-Solv) to display the graph solve menu.

[SHIFT] [F5] (G-Solv)

[F1] (ROOT) .... Root
[F2] (MAX) ..... Maximum
[F3] (MIN) ..... Minimum
[F4] (Y-ICPT) ... *y*-intercept
[F5] (ISCT) ..... Intersections of two graphs
[F6] (▷) ..... Next menu

[F6] (▷)



[F1] (Y-CAL) .... *y*-coordinate for a given *x*-coordinate
[F2] (X-CAL) .... *x*-coordinate for a given *y*-coordinate
[F3] ($\int dx$) ..... Integral for a given range
[F6] (▷) ..... Previous menu

9-2 Analyzing a Function Graph

The following two graphs are used for all of the examples in this section, except for the example for determining the points of intersection for two graphs.

Memory location Y1 = $x + 1$

Memory location Y2 = $x(x + 2)(x - 2)$

Use the View Window to specify the following parameters.

(A)

Xmin	=	–5	Ymin	=	–5
Xmax	=	5	Ymax	=	5
Xscale	=	1	Yscale	=	1

(B)

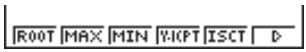
Xmin	=	–6.3	Ymin	=	–3.1
Xmax	=	6.3	Ymax	=	3.1
Xscale	=	1	Yscale	=	1

■ Determining Roots

Example **To determine the roots for $y = x(x + 2)(x - 2)$**

View Window: **(B)**

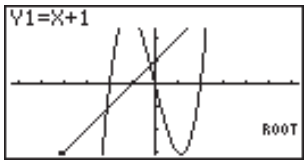
SHIFT F5 (G-Solv)



F1

F1 (ROOT)

(This puts the unit into standby waiting for selection of a graph.)

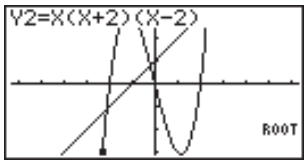


- A " ■ " cursor appears on the graph that has the lowest memory area number.

Specify the graph you want to use.

▼

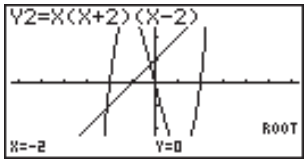
- Use ▲ and ▼ to move the cursor to the graph whose roots you want to find.



Determine the root.

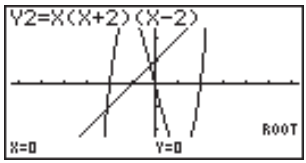
EXE

- Roots are found starting from the left.



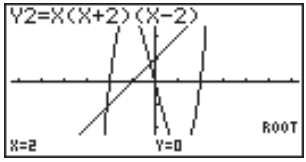
Search for the next root to the right.

▶



- If there is no root to the right, nothing happens when you press ▶.

▶



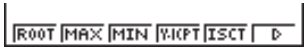
- You can use ◀ to move back to the left.
- If there is only one graph, pressing F1 (ROOT) directly displays the root (selection of the graph is not required).
- Note that the above operation can be performed on rectangular coordinate (Y=) and inequality graphs only.

■ Determining Maximums and Minimums

Example **To determine the maximum and minimum for $y = x(x + 2)(x - 2)$**

View Window: **(A)**

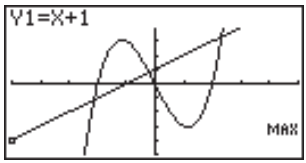
SHIFT F5 (G-Solv)



F2

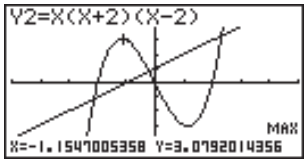
F2 (MAX)

(This puts the unit into standby waiting for selection of a graph.)



Specify the graph and determine the maximum.

▼ EXE

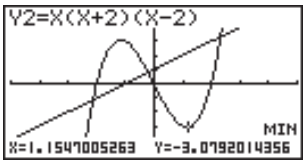


SHIFT F5 (G-Solv)

F3

Specify the graph and determine the minimum.

F3 (MIN) ▼ EXE



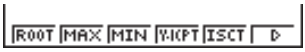
- If there is more than one maximum/minimum, you can use ◀ and ▶ to move between them.
- If there is only one graph, pressing F2 (MAX) / F3 (MIN) directly displays the maximum/minimum (selection of the graph is not required).
- Note that the above operation can be performed on rectangular coordinate (Y=) and inequality graphs only.

■ Determining *y*-intercepts

Example **To determine the *y*-intercept for $y = x + 1$**

View Window: **(B)**

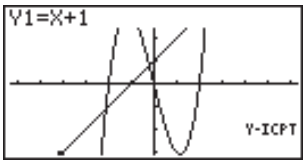
SHIFT F5 (G-Solv)



F4

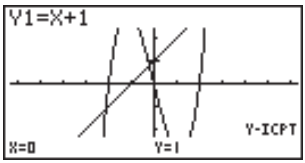
F4 (Y-ICPT)

(This puts the unit into standby waiting for selection of a graph.)



Determine the *y*-intercept.

EXE



- *y*-intercepts are the points that the graph intersects the *y*-axis.
- If there is only one graph, pressing F4 (Y-ICPT) directly displays the *y*-intercepts (selection of the graph is not required).
- Note that the above operation can be performed on rectangular coordinate (Y=) and inequality graphs only.

■ Determining Points of Intersection for Two Graphs

Example **To draw the following three graphs and then determine the points of intersection for the Graph A and Graph C.**

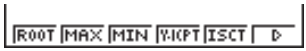
View Window: **(A)**

Graph A: $y = x + 1$

Graph B: $y = x(x + 2)(x - 2)$

Graph C: $y = x^2$

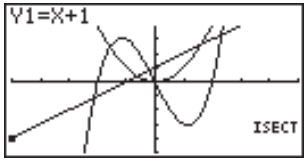
SHIFT F5 (G-Solv)



F5

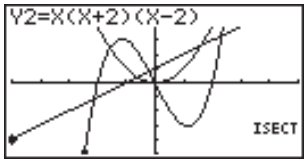
F5 (ISCT)

(This puts the unit into standby waiting for selection of a graph.)



Specify Graph A.

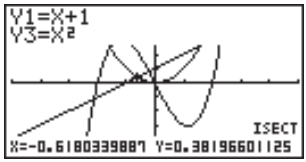
EXE



- Pressing EXE changes " ■ " into " ◆ " for specification of the first graph.

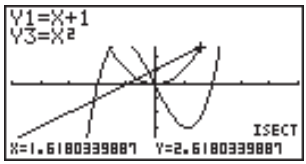
Specify the second graph (Graph C, here) to determine the points of intersection.

▼ EXE



- Use ▲ and ▼ to move " ■ " on the second graph.
- Intersections are found starting from the left.

▶



- The next intersection to the right is found. If there is no intersection to the right, nothing happens when you perform this operation.
- You can use ◀ to move back to the left.
- If there are only two graphs, pressing F5 (ISCT) directly displays the intersections (selection of the graph is not required).

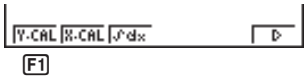
- Note that the above operation can be performed on rectangular coordinate (Y=) and inequality graphs only.

■ Determining a Coordinate (x for a given y/y for a given x)

Example **To determine the y-coordinate for x = 0.5 and the x-coordinate for y = 3.2 in the graph $y = x(x + 2)(x - 2)$**

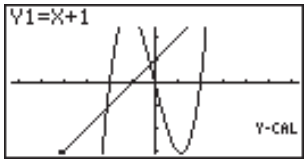
View Window: **(B)**

[SHIFT] [F5] (G-Solv) [F6] (▷)



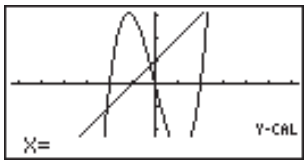
[F1]

[F1] (Y-CAL)



Specify a graph.

[▼] [EXE]



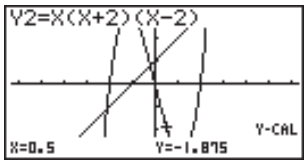
- At this time, the unit waits for input of an x-coordinate value.

Input the x-coordinate value.

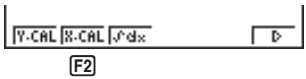
[0] [•] [5]

Determine the corresponding y-coordinate value.

[EXE]



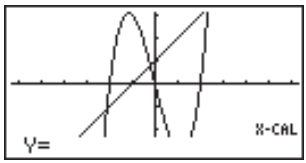
[SHIFT] [F5] (G-Solv) [F6] (▷)



[F2]

Specify a graph.

F2(X-CAL) ▼ EXE



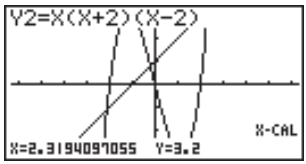
- At this time, the unit waits for input of a *y*-coordinate value.

Input the *y*-coordinate value.

3 • 2

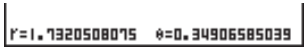
Determine the corresponding *x*-coordinate value.

EXE

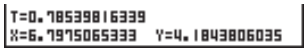


- If there is more than one *x*-coordinate value for a given *y*-coordinate value or more than one *y*-coordinate value for a given *x*-coordinate value, use ▶ and ◀ to move between them.
- The display used for the coordinate values depends on the graph type as shown below.

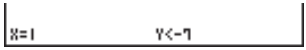
  - **Polar Coordinate Graph**



  - **Parametric Graph**



  - **Inequality Graph**



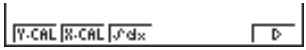
- Note that you can not determine a *y*-coordinate for a given *x*-coordinate with a parametric graph.
- If there is only one graph, pressing F1 (Y-CAL) / F2 (X-CAL) directly displays the *x*-coordinate/*y*-coordinate (selection of the graph is not required).

■ Determining the Integral for Any Range

Example $\int_{-1.5}^{0} x(x+2)(x-2)\,dx$

View Window: **(A)**

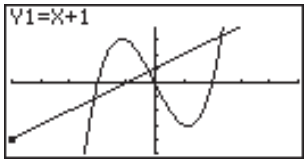
SHIFT F5 (G-Solv) F6 (▷)



F3

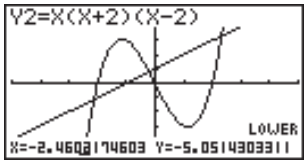
F3 ($\int dx$)

(Graph selection standby)



Select graph.

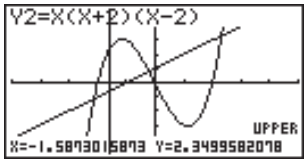
▼ EXE



- The display is prompting input of the lower limit of the integration range.

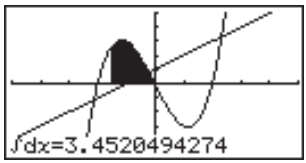
Move the pointer and input the lower limit.

▶~▶ EXE



Input the upper limit and determine the integral.

▶~▶ EXE



- The lower limit must be less than the upper limit when specifying the integration range.
- Note that the above operation can be performed on rectangular coordinate (Y=) graphs only.

9-3 Graph Solve Precautions

- Depending on the View Window parameter settings, there may be some error in solutions produced by Graph Solve.
- If no solution can be found for any of the above operations, the message “Not Found” appears on the display.
- The following conditions can interfere with calculation precision and may make it impossible to obtain a solution.

  * When the solution is a point of tangency to the x-axis.

  * When the solution is a point of tangency between two graphs.