Solving a Literal Equation Using the Graphic Method (Volume of a Cylinder)

The Solver mode is used to solve one unknown variable by inputting known variables. There are three methods: Equation, Newton's, and Graphic. The Equation method is used when an exact solution can be found by simple substitution. Newton's method implements an iterative approach to find the solution once a starting point is given. When a starting point is unavailable or multiple solutions are expected, use the Graphic method. This method plots the left and right sides of the equation and then locates the intersection(s).

Example

Use the Graphic method to find the radius of a cylinder giving the range of the unknown variable.

The formula : $V = \pi r^2 h$ (V = volume r = radius h = height)

1. Find the radius of a cylinder with a volume of $30in^3$ and a height of 10in, using the Graphic method.

2. Save the formula as "V CYL".

3. Find the radius of a cylinder with a volume of $200in^3$ and a height of 15in, using the saved formula.

Before Starting There may be differences in the results of calculations and graph plotting depending on the setting. Return all settings to the default value and delete all data.

Step & Key Operation
*Use either pen touch or cursor to operate.

Display

Notes

1-1 Access the Solver feature.

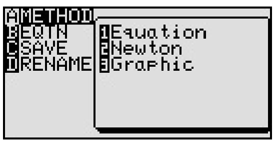
2nd F SOLVER

This screen will appear a few seconds after "SOLVER" is displayed.

1-2 Select the Graphic method for solving.

2nd F SOLVER A *

3 *



1-3 Enter the formula $V = \pi r^2 h$.

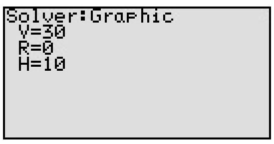
ALPHA V ALPHA = 2nd F π ALPHA

R x^2 ALPHA H

1-4 Enter the values: V = 30, H = 10. Solve for the radius (R).

ENTER 3 0 ENTER * ▼ * 1

0 ENTER ▲ * 2nd F EXE



Step & Key Operation	***Display***	***Notes***

*Use either pen touch or cursor to operate.

1-5 Set the variable range from 0 to 2.

[0] [ENTER]* [2] [ENTER]

```
Graphic solver
variable range
BEGIN=0
END=2
```

The graphic solver will prompt with a variable range for solving.

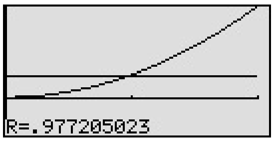
$r^2 = \dfrac{30}{10\pi} = \dfrac{3}{\pi} < 3$

$r = 1 \rightarrow r^2 = 1^2 = 1 < 3$
$r = 2 \rightarrow r^2 = 2^2 = 4 > 3$

Use the larger of the values to be safe.

1-6 Solve.

[2nd F] [EXE] ([CL])



The solver feature will graph the left side of the equation (volume, $y = 30$), then the right side of the equation ($y = 10r^2$), and finally will calculate the intersection of the two graphs to find the solution.
The radius is 0.98 in.

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2 Save this formula.
Give the formula the name “V CYL”.

[2nd F] [SOLVER] [C]* [ENTER]*
[V] [SPACE] [C] [Y] [L] [ENTER]

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TITLE:V CYL
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3-1 Recall the formula.
Enter the values: V = 200, H = 15.

[2nd F] [SOLVER] [B]* [0] [1]*
[ENTER] [2] [0] [0] [ENTER] [0] [ENTER]
[1] [5] [ENTER]

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Solver:Graphic
 V=200
 R=0
 H=15
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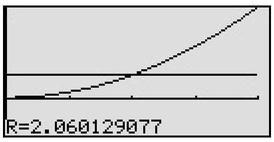
3-2 Solve the radius setting the variable range from 0 to 4.

[▲]* [2nd F] [EXE] [0] [ENTER] [4]
[ENTER] [2nd F] [EXE]



$r^2 = \dfrac{200}{15\pi} = \dfrac{14}{\pi} < 14$

$r = 3 \rightarrow r^2 = 3^2 = 9 < 14$
$r = 4 \rightarrow r^2 = 4^2 = 16 > 14$

Use 4, the larger of the values, to be safe.
The answer is : $r = 2.06$

One very useful feature of the calculator is its ability to store and recall equations. The solution from various values for known variables can be easily obtained by recalling an equation which has been stored and giving values to the known variables. The Graphic method gives a visual solution by drawing a graph.