

SYSTEMS: Quadratic-Linear Systems – 90%

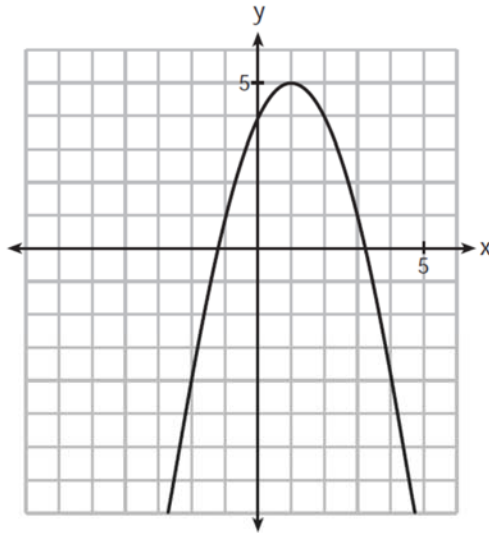
www.jmap.org

For purposes of this topic, a quadratic may be either a parabola or a circle. The question may ask:

- for the number of solutions to the system,
- for the solution(s) to the system,
- for one variable in the solution(s), or
- whether the solution(s) are real, rational, irrational or imaginary.

The question usually provides the equations of both the linear and quadratic functions. If the graph of the quadratic function is provided instead, modeling the quadratic with an equation allows a calculator solution.

The graph of a quadratic function is shown below.



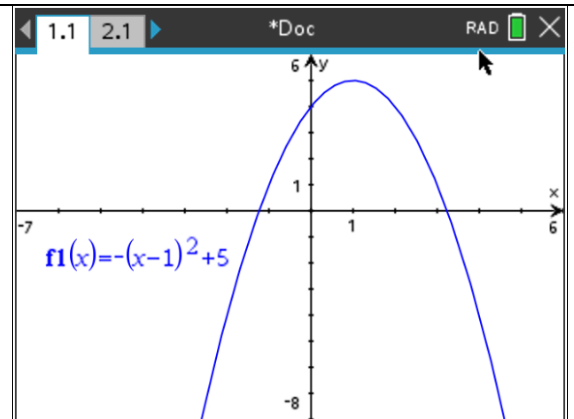
When the graph of $x + y = 4$ is drawn on the same axes, one solution to this system is

- (1) (4,0) (3) (2,2)
(2) (1,5) (4) (3,1)

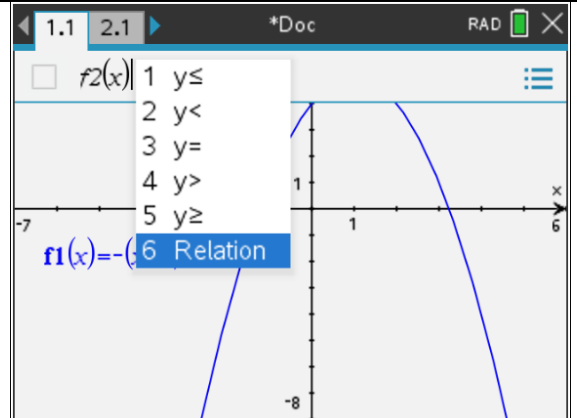
082305aii

Add a Graphs page.

The given quadratic is a reflection over the x -axis and a translation 1 to the right and 5 up of the parent quadratic function.

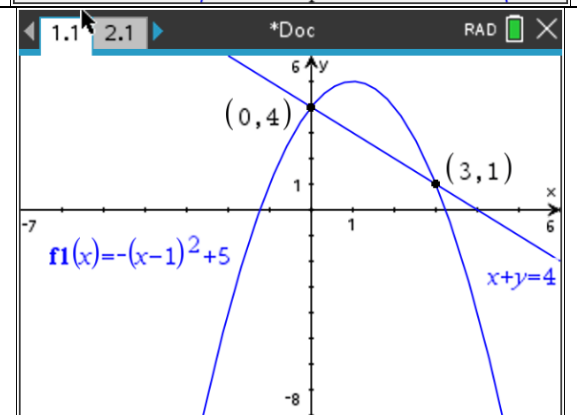


To write the linear function as a relation, enter tab, del, 6 and the equation.



To find the solutions to the system, enter:
menu, 8, 1, 4 and click on the graphs of both functions.

(4) is the correct response.



If this were an open ended question, algebraic work similar to this is required for full credit:

$$\begin{aligned}
 y &= -(x-1)^2 + 5 & 3+y &= 4 \\
 4-x &= -x^2 + 2x - 1 + 5 & y &= 1 \\
 x^2 - 3x &= 0 \\
 x(x-3) &= 0 \\
 x &= 0, 3
 \end{aligned}$$

If the quadratic is a circle, the equation may be entered as a relation.

Algebraically solve the following system of equations.

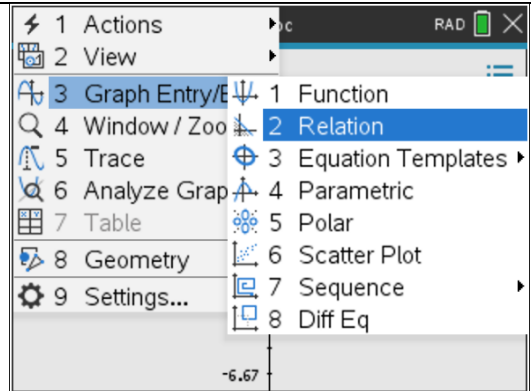
$$(x-2)^2 + (y-3)^2 = 16$$

$$x + y - 1 = 0$$

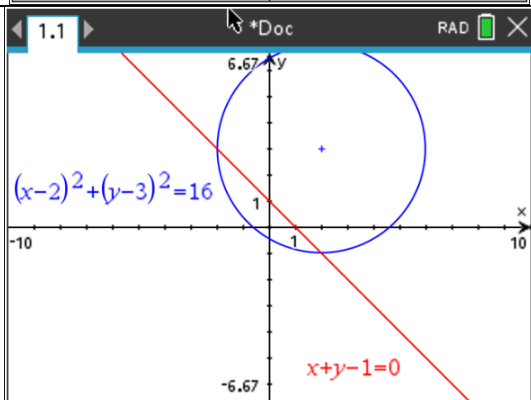
012035aii

Add a Graphs page.

Another way to enter a relation is:
menu, 3, 2

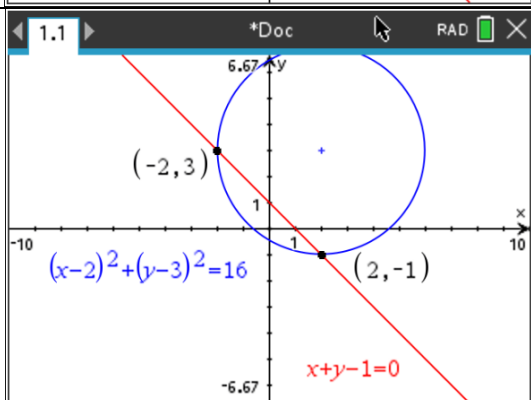


Enter both relations.



To find the solutions to the system, enter:
menu, 8, 1, 4 and click on the graphs of both functions.

$(-2,3)$ and $(2,-1)$ is the correct response.



Algebraic work similar to this is required for full credit:

$$y = -x + 1 \quad y = -2 + 1 = -1 \quad (2, -1)$$

$$(x - 2)^2 + (-x + 1 - 3)^2 = 16 \quad y = 2 + 1 = 3 \quad (-2, 3)$$

$$x^2 - 4x + 4 + x^2 + 4x + 4 = 16$$

$$2x^2 = 8$$

$$x = -2, 2$$

If the graphs of the quadratic and line do not intersect, the solutions can be described as imaginary.

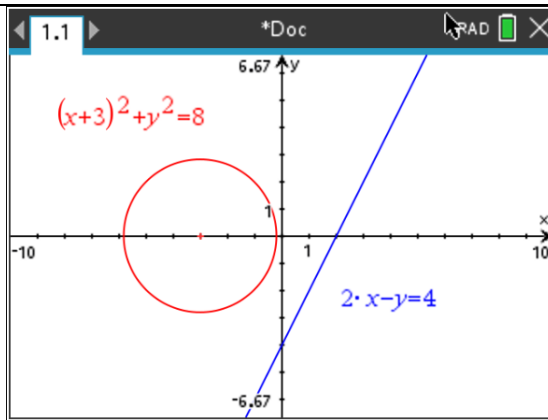
Consider the system shown below.

$$2x - y = 4$$
$$(x + 3)^2 + y^2 = 8$$

The two solutions of the system can be described as

- (1) both imaginary (3) both rational
(2) both irrational (4) one rational and one irrational

081719aii



For more questions, go to <https://www.jmap.org/htmlstandard/A.REI.C.7.htm>.