Moveable Lines

Aim

- Determine solutions of literal equations and general solution of equations involving a single parameter
- Determine solutions of simple systems of simultaneous linear equations, including consideration of cases where no solution or infinite number of possible solutions exist (geometric interpretation only required for two equations in two variables)
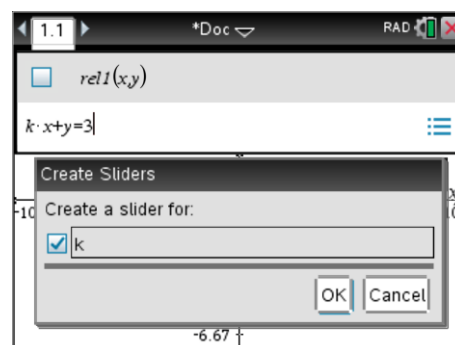
Instructions

Consider the following pair of linear simultaneous equations where k is a constant.

$$kx + y = 3$$
$$2x + (k+1)y = 6$$

Enter the equations using the relational graphing type.

Since k has not been defined anywhere a slider can automatically be created, select OK to create the slider.

A multiplication sign must be entered between two alpha characters such as the k and x in the first equation.

With the cursor over the slider, press **Ctrl** + **Menu**, this activates the contextual menu [right mouse click] for the slider; select settings and set the slider as shown opposite.

Enter the second equation in relation 2; notice that since a slider has already been established for k you are not prompted for another. The one slider will control the value of k in both equations.
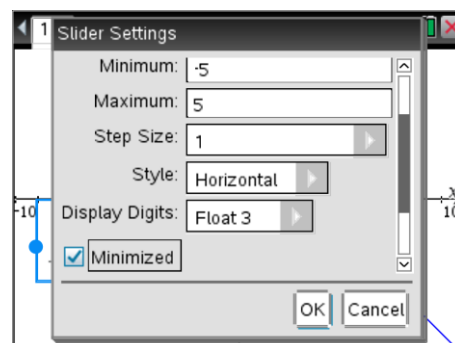
Question: 1

Use the slider to vary the value of k and observe what happens on the screen, record your observations.

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Question: 2

Use algebra to find the solution to the set of simultaneous equations for each of the following cases:

a) $k = 0$

b) $k = -1$

c) $k = 2$

Sketch the corresponding straight lines; indicate the point of intersection and gradient for line for each value of k above. Check your CAS calculator.

Question: 3

By consideration of the gradients in the previous question, determine all the values of k for which:

a)   There is more than one solution

b)   There are no solutions

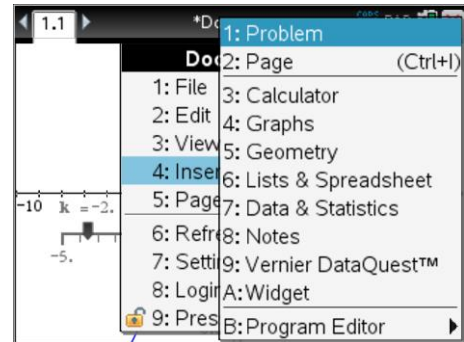Explain graphically (or geometrically) what this means in each case.

Instructions

Insert a Graph Application in a New Problem in this document.

Doc > Insert > Problem

Enter the following equations using the relation graphing tool and add a slider as before.

$$x - y = k$$
$$x + ky = 6$$

Question: 4

Use the slider to vary the value of k and observe what happens on the screen, record your observations.

Question: 5

Use algebra to find the solution to the set of simultaneous equations for each of the following cases:

a) $k = 0$

b) $k = -1$

c) $k = 2$

Sketch the corresponding straight lines; indicate the point of intersection and gradient for line for each value of k above. Check your CAS calculator.

Question: 6

Explain why it is not possible to have infinitely many solutions for this set of equations.

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