Linear-Quadratic Inequalities

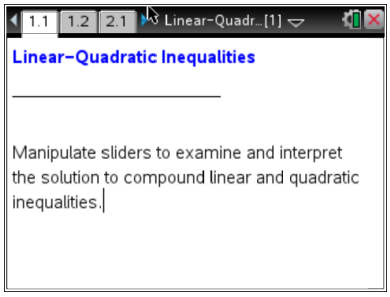
Student Activity

Name _____

Class _____

Open the TI-Nspire™ document
***Linear_Quadratic_Inequalities.tns*.**

In this activity, you will manipulate sliders to examine and interpret the solutions to compound linear and quadratic inequalities.



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1. Select ▲ and ▼ to change the values of *m* and *k* such that *m* = 1 and *k* = –2.

   a. What do the shaded areas above the parabola and below the line represent?

   b. Describe the solution of the compound inequality $y > x^2 + 2x - 4$ and $y < x - 2$.

   c. Choose a point in the solution area described in part 1b and show that it satisfies the compound inequality $x^2 + 2x - 4 < y < x - 2$.

   d. How would you explain to a friend what regions to shade if he or she were graphing the inequality by hand?

   e. Select the inequality to change $y > x^2 + 2x - 4$ to $y < x^2 + 2x - 4$. Describe the solution of the compound inequality $y < x^2 + 2x - 4$ and $y < x - 2$.

2. Change the inequality symbol and use the sliders to obtain the solution to compound inequality: $y > x^2 + 2x - 4$ and $y < -0.5x - 0.5$.

   a. Describe the solution of $x^2 + 2x - 4 < y < -0.5x - 0.5$.

   b. Use this information to solve the inequality $x^2 + 2x - 4 < -0.5x - 0.5$.
   Explain your reasoning.

   c. Describe the solution of $y > x^2 + 2x - 4$ and $y > -0.5x - 0.5$.

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3. Use the sliders to change the values of *a, h,* and *k* such that $a = 2$, $h = 1$, and $k = 0$.

   a. Show how to obtain the coordinates of the two labeled points algebraically.

   b. Describe the solution of $2(x - 1)^2 < y < -x^2 + 2x + 2$.

   c. What are the domain and range of the points in the solution set?

   d. Explain how you obtained your answer to part 3c.

4. If possible, give values of *a, h*, and *k* such that the solution set of the compound inequality $y < -x^2 + 2x + 2$ and $y > a(x - h)^2 + k$ is

   a. a single point

   b. two points

   c. the empty set

5. Are your answers to question 4 the only correct answers? Explain.

6. If the inequalities in question 4 were changed to $y \leq -x^2 + 2x + 2$ and $y \geq a(x - h)^2 + k$, would any of your answers change? Explain.

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7. Use the sliders to change the values of m and b such that $m = –0.5$ and $b = 0$.
   a. Write an inequality to represent the shaded area in the interior of the circle.

   b. Adjust the sliders so that the line goes through the diameter of the circle, and write its equation.

   c. Is there more than one correct answer to part 7b? Why?

   d. Write a compound inequality that describes
      i. the area below the diameter and in the interior of the circle

      ii. the area above the diameter and in the exterior of the circle