WORKSHEET

Solving Quadratic Inequalities

Objectives:

- İkinci dereceden bir değişkenli fonksiyonun alacağı değerlerin işaretini inceler ve ikinci dereceden bir bilinmeyenli eşitsizliklerin çözüm kümesini bulur.
- Çözüm kümesi cebir ve grafik yardımıyla incelenir.
- $ax + b$ veya $ax^2 + bx + c$ şeklindeki ifadelerin çarpımı veya bölümü biçiminde verilen eşitsizliklerin çözüm kümesi de buldurulur.
- Bilgi ve iletişim teknolojilerinden yararlanılabilir.
- İkinci dereceden bir bilinmeyenli denklemi çözmeden köklerinin varlığını ve işaretini belirler.
- Sadece gerçek köklere sahip denklemler incelenir.
- Parametre içeren ikinci dereceden bir bilinmeyenli bir denklemin köklerinin varlığını ve işareti parametrenin alacağı değerlere göre tablo üzerinde belirlenir.


Materials:

- Worksheet
- TI-84 Plus calculator
- Excel software

Instructions:

It is 60 minute homework to complete. Questions are asked in the solution order and at the end there is a real life example to show your understanding. All answers should be explained in detail and solve step by step.

**WEEKEND WORKSHEET (60 min)**

1. Open an excel page on your computer. Write down the following table on this page by starting with A1 column. Write down the value x to A1, the value 1 to A2 the value y to B1, and continue like this. Create the table below.

| X | Y |
|---|---|
| 1 | |
| 2 | |
| 3 | |

Go to the B2 column and select it. Click on the formula bar and write down the function =RANDBEETWEEN (0; 10) and press enter. This function will bring a random number to the B2 column. Push your mouse to the right bottom of the column and when the cursor turns to "**+**" click on it and push it down to the B4. The computer brings values to these three columns randomly.

Now you have x and y values. On your TI 84 calculator, press STAT and ENTER. The screen should be like this: (If it is not, go $L_1$, $L_2$, and $L_3$ by using the up arrow and press CLEAR to make the table clear.)



Write down the x values to $L_1$ and y values to $L_2$. For example it will get;



Press $2^{ND}$ and Y=. You will be in STAT PLOTS function. Press 1 and ENTER. Then press GRAPH to get the graph of the plot points. The screen should be like this according to this example:
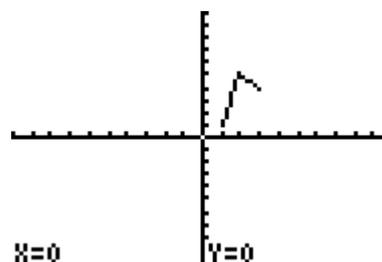


In order to find the equation of this quadratic function, press STAT, right arrow, 5: QuadReg, and the screen will be



Go down by using down arrow to Calculate and press ENTER to see the equation. For this example, the solution will be:



■

Write down this equation on a piece of paper. Press Y= and write down this equation to the $Y_1$= segment. Press graph and see the function passes through the previous graph. Clear the table $L_1$ $L_2$ by pressing STAT, ENTER. Then choose $L_1$ by the up arrow and press CLEAR ENTER. Do the same process for $L_2$.

By using your previous knowledge from quadratic function (finding the roots), find the roots by only using the TI calculator.

a) What is the quadratic function you found? How could you define and represent it? Explain.

b) How many roots are there? What are the roots? Classify these roots (real number, or complex number, equal, or unequal).

c) Fill in the chart below. First write the smallest root and then the biggest root. Write down the sign of equation to the range1, range2 and range3.

          root1     root2

X

| $ax^2$+bx+c | | | |
|---|---|---|---|

      range1    range2   range3

d) What is the relationship between the sign of the "a" value of the quadratic function and range3?

e) Find the solution set for x values that makes the quadratic function bigger than or equals to zero (ax$^2$+bx+c≥0) by using the table.

f) Find the solution set for x values that makes the quadratic function bigger than or equals to zero (ax$^2$+bx+c≤0) by using the table?

g) Find the solution set for x values that makes the quadratic function bigger than

or equals to zero (ax$^2$+bx+c=0) by using the table.

2. Do the same process on the question 1 by multiplying the $L_2$ column by (-1) and answer the following:

a) What is the quadratic function?

b) How many roots are there? What are the roots? Classify these roots (real number, or complex number, equal, or unequal).

c) Fill in the chart below. First write the smallest root and then the biggest root. Write down the sign of equation to the range1, range2 and range3.

          root1     root2

X

| $ax^2$+bx+c | | | |
|---|---|---|---|

    range1    range2   range3

d) What is the relationship between the sign of the "a" value of the quadratic function and range3?

e) Find the solution set for x values that makes the quadratic function bigger than or equals to zero (ax$^2$+bx+c≥0) by using the table.

f) Find the solution set for x values that makes the quadratic function bigger

than or equals to zero (ax²+bx+c≤0) by using the table?

$$b)\frac{|x-3|}{x^2-5x-6}\geq 0$$

g) Find the solution set for x values that makes the quadratic function bigger than or equals to zero (ax²+bx+c=0) by using the table.

3) Find the roots and solution sets of functions below and make a signature table for them. (Use TI calculators for finding roots and completing table)

a) $x^2 - 2x + 1 \leq 0$

b) $x^2 - x + 1 > 0$

4) Compare question 1 & 2 with question 3. Why do sign of the tables not change according to the roots? Explain in your own words.

5) Find the solution set of the following equations with using the table. Explain why does the sign change at the root of the denominator?

a)$\frac{x}{5} \geq \frac{5}{x}$

6) A contractor buys a land and wants to make a private house on it. He calculated the area 2000 square feet and since the landscaping process, he has to build house on the at most 1500 square feet. The house base is projected as rectangular shaped and one side of it is 20 feet longer than the other side.

- Write down the quadratic function of rectangular.
- Find the values of one edge.
- What restrictions are placed on your solution?
- Use graph and table methods to solve the problem.
- Explain your reasoning step by step.

7) Evaluate your work and self-assess your understanding. Which part did you found challenging or leave unclear?

REFLECTION

In this worksheet, I aimed to prepare questions easier to harder. I gave an example to make instructions more clear. I tried to tell and explain each steps in detail. In first question, students solve equation with a little scaffolding. However, in second question, students do the opposite of the same question by themselves. After these two questions, students reach a conclusion and in further questions, these conclusions construct their own understanding and therefore reasoning. The most challenging part for me is asking their conceptual understanding. I wanted students to reach special key concepts that they never forgave. For the last question, I aimed that students can solve question by themselves and give reasoning for each step of solution. Therefore, the order of the questions is really important for their knowledge.

In using TI calculator, I searched for an application or function that made students to reach multiple representations and visualize the solution. Before trying to solve equations students will be able to see the table, graph and sign of the function immediately. This will give students the opportunity of comparing results of questions and methods of solutions. Students also are able to give the reasoning of their judgment. Therefore, students can reach the advantages of technology and use for their own understanding.

At the end, I asked a reflection about students' self-assessment. It is important for students to see their own misconceptions or misunderstanding of the subject. For this purpose, students should construct their own knowledge and evaluate it according to this type of assessments. Therefore, the very last question can also be used for self-motivation and important for the reliability of the worksheet results.