

WORKSHEET FOR 10 GRADERS QUADRATIC EQUATIONS

Subject: Quadratic Functions (Finding roots of quadratic functions)

Necessary Equipments: TI-84 Plus Calculator, computer

Necessary Applications: You do not need any application but you need to write three small programs.

Time: Worksheet should be completed in one hour.

Notes: While you are using your TI-84 Plus Calculator do not forget minus - and negative signs are different. If you press minus instead of negative sign you will get automatically syntax error.

To find the i value press [2ND] and then [.]

This is an individual weekend worksheet and students do not allowed to ask help from their parents.

Kazanımlar

10.6.1.1. İkinci dereceden bir bilinmeyenli denklemleri çözer.

İkinci dereceden bir bilinmeyenli denklemlerin gerçek köklerin varlığı diskriminantın işaretine göre incelenir.

10.6.2.1. İkinci dereceden bir değişkenli fonksiyonu açıklar ve grafiğini çizer.

Fonksiyonun grafiğinin tepe noktası ile fonksiyonun en küçük ya da en büyük değeri ilişkilendirilir.

Bilgi ve iletişim teknolojilerinden yararlanılabilir.

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QUESTIONS

Exercises with Ti-84 Plus Calculator:

1. Find the roots of the following equations by using your graphing calculator

$y=x^2-7x+12$ and $y=x^2-x+4$. What did you notice about the roots? Are they in different or same planet? If not why do you think it is like that? Explain your reasoning.

To solve this question, first you should write a small program to your calculator:

Step 1. Press [PRGM] button.

Step 2. Highlight NEW by using right arrow. Press [ENTER] button.

Step 3. Give a name to your program. To use the letters first press [ALPHA] button then letters.

Step 4. Press [ENTER] button.

Step 5. Press [2ND] then 0 to see the CATALOG.

Step 6. Scroll down and highlight a+bi then press [ENTER].

Step 7. Press [ENTER] button.

Step 8. Press [PRGM] and highlight I/O scroll down and select Prompt.

Step 9. Press [ENTER] button.

Step 10. Write A,B,C which basically says we have "A,B and C" value.

Step 11. Press [ENTER] button.

Step 12. Write the formula : $(-B-(B^2-4AC))/(2A)$

Step 13. Press [STO] button and write "D".

Step 14. Press [ENTER] button.

Step 15. Write the formula : $(-B+(B^2-4AC))/(2A)$

Step 16. Press [STO] button and write "E".

Step 17. Press [ENTER] button.

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Step 18. Press [PRGM] highlight I/O select Disp and press [ENTER].

Step 19. Press [ENTER] button again.

Step 20. Press [2ND] then 0. Highlight Real and press [ENTER].

Step 21. To run your program press [PRGM] and select EXEC and choose your program name.

Your basic steps should be:

```

EXEC EDIT [F1] Create New
PROGRAM Name=QUAD
CATALOG
  AsmPrm
  augment(
  AUTO Answer
  AxesOff
  AxesOn
  ▶a+bi
  bal(
CTL [F2] EXEC
  1: Input
  2: Prompt
  3: Disp
  4: DispGraph
  5: DispTable
  6: Output(
  7: getKey

PROGRAM: QUAD
: a+bi
: Prompt A,B,C
: █

PROGRAM: QUAD
: a+bi
: Prompt A,B,C
: (-B-J(B^2-AC))/
2A)█

PROGRAM: QUAD
: a+bi
: Prompt A,B,C
: (-B-J(B^2-AC))/
2A)→D
: (-B+J(B^2-AC))/
2A)→E

CTL [F2] EXEC
1: Input
2: Prompt
3: Disp
4: DispGraph
5: DispTable
6: Output(
7: getKey

CATALOG
  randInt(
  randIntNoRep(
  randM(
  randNorm(
  re^θt
  ▶Real
  real(
  █

A=?1
B=?-7
C=?12

3
4
Done
  
```

- Now you are ready to extend your program. As you know, before finding the roots you can decide if the roots exists or not. In other words, you can find discriminant. Extend your program by finding discriminant first. Show your work by screenshots and explain your reasoning.

Hint: Use the written steps above as an example. It will be very helpful for you because you need to do similar things. Just for remind you we calculate the vertex with the formula $-b/2a$.

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3. Find the vertex of the equation $y=x^2-4x+6$ by using your Ti-84 Plus calculator. Predict what would happen to vertex if your equation equals $y=x^2-4x+12$ and $y=x^2-6x+6$. Why do you think like that? Which values have been changed to get each equation? (a, b or c?) Check your answers by using your Ti calculator.

To solve this question first you should write a small program in your Ti-84 Calculator:

Step 1. Press [PRGM] button.

Step 2. Highlight NEW by using right arrow. Press [ENTER] button.

Step 3. Give a name to your program. To use the letters first press [ALPHA] button then letters.

Step 4. Press [ENTER] button.

Step 5. Press [PRGM] button. Highlight I/O and select Prompt.

Step 6. Press [ENTER] button.

Step 7. Write "A, B". Press [ENTER].

Step 8. Write $-(B)$ and press [STO] button. Now you have an arrow. Write "C" there.

Step 9. Press [ENTER].

Step 10. Write $2(A)$ then press [STO] button. Now you have an arrow. Write "D" there.

Step 11. Now write C/D then press [STO] button. Now you have an arrow. Write "E" there.

Step 12. Press [PRGM] and highlight I/O and select Disp. Press [ENTER]. Write "E" there.

Step 13. Write [2ND] and [MODE] to quit your program.

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Your steps should like:

```
EXEC EDIT [F2]
[ESC]Create New
```

```
CTL [F2] EXEC
1:Input
2:Prompt
3:Disp
4:DispGraph
5:DispTable
6:Output(
7:↓getKey
```

```
PROGRAM: VERTEX
:Prompt A,B
:-(B)→C
```

```
PROGRAM: VERTEX
:Prompt A,B
:-(B)→C
:2(A)→D
:C/D→E
```

```
CTL [F2] EXEC
1:Input
2:Prompt
3:Disp
4:DispGraph
5:DispTable
6:Output(
7:↓getKey
```

```
PROGRAM: VERTEX
:Prompt A,B
:-(B)→C
:2(A)→D
:C/D→E
:Disp E
```

```
[F2] EDIT NEW
1:A
2:G
3:0
4:QOARFORM
5:QUAD
6:VERTEX
```

```
Pr9m0
A=?1
B=?-4
```

```
2
Done
```

Real Life Statement:

4. Pelin bought a beautiful framework for her dorm-room. The length of the framework was three more than twice the width of the framework. Pelin has a rectangular picture to put in the framework. The area of the picture is 27 m^2 and what is the minimum area that the picture can put in the framework? Solve this question by using your program that you wrote to your calculator.



5. Ali throws a ball into the air and the height m , in feet of the ball at a given time s , $m = -16t^2 + 64t + 80$ where $s > 0$. Find the time it takes the ball to strike the ground and find the maximum height of the object. First solve the question with pencil and paper then using your calculator. Write a short paragraph about the benefits of using calculator for this question.

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Example with Microsoft Excel

6. Find the roots of the following functions $y=x^2+8x+15$, $y=x^2+8x+16$ by using Microsoft Excel. Before you begin, think if these equations have the same roots and vertex. Explain your reasoning. Then graph these two equations from a table of values $x=-1, 0, 1, 2, 3$ on the different axes and see the difference between them. Show your work and explain the relationship between the roots and coefficients.

Step 1. Write a, b and c values in cells.

Step 2. Lets assume that you are working with D column. Write value of a in D1, value of b in D2 and value of c in D3.

Step 3. To get the roots write the formula in cell D4.

$$=(-D2+ (D2*D2-4*D1*D3)^{1/2})/2*D1$$

Step 4. To get the roots write the formula in cell D5.

$$=(-D2-(D2*D2-4*D1*D3)^{1/2})/2*D1$$

Step 5. To get the vertex write the Formula in cell D6.

$$=(-D2/(2*D1))$$

To Graph:

Step 1. Write x in one column and y the other column.

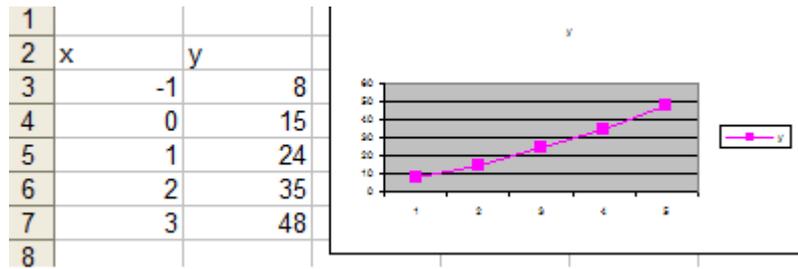
Step 2. Write the table of values under the cell which you wrote x.

Step 3. Calculate y values bu plugging x values in the equation.

Step 4. select all the values and click on graphic wizard.

Step 5. Follow the same steps for graphing the other equation.

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7. Write a small journal that reflects your experiences and problems that you came across while doing this worksheet. Your journal should require at least the following questions' answers: "What surprised you most? What kind of problems you had while doing your worksheet? What did you do to overcome these problems? Which question was the most challenging for you? Why?"