

Section 4-5 Quadratic Equations

Learning Goal: To understand how to solve quadratic equations by factoring.
To understand how to solve quadratic equations by graphing.

Essential Questions: What are the advantages of a quadratic function in vertex form?
What are the advantages of a quadratic function in standard form?
How is any quadratic function related to the parent function of $y = x^2$?
How are the real solutions of a quadratic equation related to the graph of the related quadratic function?

Warm Up:

Identify the axis of symmetry, maximum or minimum value, and the domain and range of each function.

1. $y = -x^2 + 6x + 5$

2. $y = -3(x+2)^2 + 1$

3. Rewrite the equation $y = -3x^2 - 6x - 8$ in vertex form. Identify the vertex and the axis of symmetry of the graph.

4. Find the quadratic model in standard form for the set of values (0,3), (1, 10), (2, 19)

5. Write the expression $3x^4 - 12x^3 - 36x^2$ in factored form. Explain how you know the expression is completely factored.

Vocabulary:

Zero of the function- a value of x for which $f(x) = 0$

Zero-Product Property - when a quadratic is in factored form, you set the factors to zero and solve.

If $ab = 0$, then $a = 0$ or $b = 0$.

You Try:

1. $x^2 - 5x + 6 = 0$

2. $x^2 - 7x = -12$

3. $x^2 + 3x - 18 = 0$

4. $x^2 = -5x - 6$

5. $3x^2 + 9x + 4 = -11x - 8$

6. $4x^2 - 2x = 0$

Solving quadratics with a graphing calculator:

Table:

- Enter the equation in Y_1 (equation must be in standard form)
- Hit (second-graph) to get the table
- Look for when Y_1 equals 0
- Write the ordered pair for the zero $(x, 0)$
- There should be two solutions so look for the second
- Sometimes you might need to change the interval on the x value to .1

7. $5x^2 + 30x + 14 = 2 - 2x$

8. $4x^2 - 14x + 7 = 4 - x$

9. $10x^2 + 2x - 46 = x - 4$

Graphing -

- Enter the equation in Y_1 (equation must be in standard form)
- Hit (second-calc) and choose the zero option
- The zeros will appear on the screen

Try Some:

10. $2x^2 + 7x = 15$

11. $x^2 + 2x - 24 = 0$

12. $5x^2 - 8 = 18x$

Word Problems:

13. The function $f(x) = -0.002x^2 + 0.77x$ models the path of a baseball, where $f(x)$ gives the height of the ball and x gives the distance from where it is hit in feet.

a) How far does the ball travel before hitting the ground?

b) How high does the ball go?

c) What is a reasonable domain and range for such a function?

14. Suppose you have an outdoor pool measuring 25 ft by 10 ft. You want to add a cement walkway around the pool. If the walkway will be 1 ft thick and you have 304 ft² of cement, **how wide should the walkway be?**

(Understanding)

- a) Draw a diagram of the pool and the walkway. Let x = width of the walkway in feet.

- b) If you lay the pieces of the walkway end to end, what is the total length of the walkway?

- c) What is the thickness of the walkway?

- d) What is the problem asking you to determine?

(Planning)

- e) Write a quadratic equation to model the volume of the walkway.

- f) What method can you use to find the solutions of your quadratic equation?

(Getting an Answer)

- g) How many solutions of your quadratic equation do you need to find? Explain.

- h) How wide should the walkway be?

Closure: What are three ways to find the zeros of a quadratic equation?

Assignment: section 4.5 # 9,14,17,19,25,27,30,36,37,41b(10 problems)