LESSON MAKER PRO

Parabola Boundaries

Solve quadratic inequalities by finding where signs change.

HIGH SCHOOL · MA.912.AR.3.3

MA.912.AR.3.3 "Given a mathematical or real-world context, write and solve one-variable quadratic inequalities over the real number system. Represent solutions algebraically or graphically."

NAME _____ DATE _____

TRACK THE SIGNS

Factor the quadratic when possible, then use its zeros to split the number line into intervals. Test the sign of the factors in each interval, and include a zero for <= or >=, but not for < or >.

WORKED EXAMPLE

Solve x^2 - 13x + 30 >= 0.

1. Factor: (x - 3)(x - 10) >= 0.
2. The zeros 3 and 10 split the number line into three intervals.
3. The product is positive outside the zeros.
4. Include both zeros because the inequality is >= 0.

Answer: x <= 3 or x >= 10

PRACTICE 6 problems

1 Solve x^2 + x - 20 < 0.

ANSWER _____

2 Solve x^2 - x - 2 >= 0.

ANSWER _____

3 Solve -x^2 + 9x - 14 > 0.

ANSWER _____

4 Solve x^2 + 6x + 5 <= 0.

ANSWER _____

5 Solve (x - 4)(x + 6) > 0.

ANSWER _____

6 Solve x^2 - 16 <= 0.

ANSWER _____

APPLY IT Show your work

1 At a school game, a spirit launcher sends a T-shirt upward. Its height in meters is modeled by h(x) = -x^2 + 12x + 7, where x is time in seconds. For what times is the T-shirt at least 7 meters high?

WORK SPACE

ANSWER _____

2 A student club models its profit from an online art sale by P(x) = -x^2 + 16x - 55, where P is in hundreds of dollars and x is the number of weeks the sale runs. For what values of x is the profit positive?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Solve x^2 + 4x + 4 > 0. Explain why exactly one value of x is excluded.

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ANSWER KEY

Parabola Boundaries

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve x^2 + x - 20 < 0.	**-5 < x < 4**
2	Solve x^2 - x - 2 >= 0.	**x <= -1 or x >= 2**
3	Solve -x^2 + 9x - 14 > 0.	**2 < x < 7**
4	Solve x^2 + 6x + 5 <= 0.	**-5 <= x <= -1**
5	Solve (x - 4)(x + 6) > 0.	**x < -6 or x > 4**
6	Solve x^2 - 16 <= 0.	**-4 <= x <= 4**

PART 2 · APPLY IT

1. **0 <= x <= 12** Write -x^2 + 12x + 7 >= 7, then factor to get -x(x - 12) >= 0. Use the time restriction x >= 0.
2. **5 < x < 11** Set -x^2 + 16x - 55 > 0 and factor as -(x - 5)(x - 11) > 0. The profit is positive between the two zeros.

CHALLENGE

x < -2 or x > -2. Since x^2 + 4x + 4 = (x + 2)^2, the expression equals 0 only when x = -2 and is positive everywhere else.

Accept equivalent interval notation and correctly shaded number-line graphs. For the first word problem, students must use the context restriction x >= 0.