EXAMPLE 6 Use a quadratic inequality as a model

ROBOTICS The number T of teams that have participated in a robot-building competition for high school students can be modeled by

$$T(x) = 7.51x^2 - 16.4x + 35.0,\ 0 \le x \le 9$$

where x is the number of years since 1992. For what years was the number of teams greater than 100?

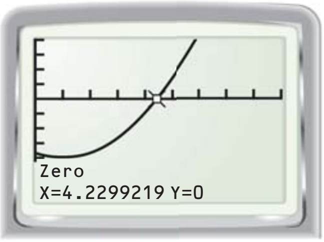
Solution

You want to find the values of x for which:

$$T(x) > 100$$

$$7.51x^2 - 16.4x + 35.0 > 100$$

$$7.51x^2 - 16.4x - 65 > 0$$



Graph $y = 7.51x^2 - 16.4x - 65$ on the domain $0 \le x \le 9$. The graph's x-intercept is about 4.2. The graph lies above the x-axis when $4.2 < x \le 9$.

▶ There were more than 100 teams participating in the years 1997–2001.

EXAMPLE 7 Solve a quadratic inequality algebraically

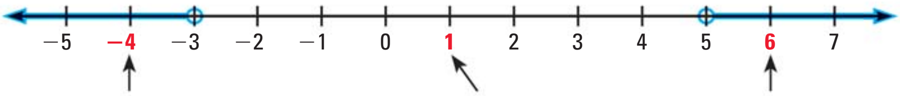
Solve $x^2 - 2x > 15$ algebraically.

Solution

First, write and solve the equation obtained by replacing > with =.

$x^2 - 2x = 15$	Write equation that corresponds to original inequality.
$x^2 - 2x - 15 = 0$	Write in standard form.
$(x + 3)(x - 5) = 0$	Factor.
$x = -3$ or $x = 5$	Zero product property

The numbers −3 and 5 are the *critical x-values* of the inequality $x^2 - 2x > 15$. Plot −3 and 5 on a number line, using open dots because the values do not satisfy the inequality. The critical x-values partition the number line into three intervals. Test an x-value in each interval to see if it satisfies the inequality.



Test $x = -4$: $(-4)^2 - 2(-4) = 24 > 15$ ✓

Test $x = 1$: $1^2 - 2(1) = -1 \not> 15$

Test $x = 6$: $6^2 - 2(6) = 24 > 15$ ✓

▶ The solution is $x < -3$ or $x > 5$.

✓ GUIDED PRACTICE for Examples 6 and 7

6. **ROBOTICS** Use the information in Example 6 to determine in what years at least 200 teams participated in the robot-building competition.

7. Solve the inequality $2x^2 - 7x > 4$ algebraically.