Name____

Section 2.7 Nonlinear Inequalities

Objective: In this lesson you learned how to solve polynomial inequalities and rational inequalities.

Important Vocabulary Define each term or concept.

Critical numbers The *x*-values that make the polynomial in a polynomial inequality equal to zero.

I. Polynomial Inequalities (Pages 197–200)

What you should learn
How to solve polynomial inequalities

Where can polynomials change signs?
Only at its zeros, the *x*-values that make the polynomial equal to zero.

Between two consecutive zeros, a polynomial must be . . .

entirely positive or entirely negative.

When the real zeros of a polynomial are put in order, they divide the real number line into . . . intervals in which the polynomial has no sign changes.

These zeros are the ____critical numbers____ of the inequality, and the resulting intervals are the ____test intervals____ for the inequality.

Complete the following steps for determining the intervals on which the values of a polynomial are entirely negative or entirely positive:

1) Find all real zeros of the polynomial, and arrange the zeros in increasing order (from smallest to largest). These zeros are the critical numbers of the polynomial.

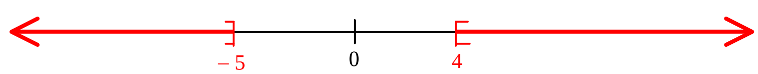
2) Use the critical numbers of the polynomial to determine its test intervals.

3) Choose one representative *x*-value in each test interval and evaluate the polynomial at that value. If the value of the polynomial is negative, the polynomial will have negative values for every *x*-value in the interval. If the value of the polynomial is positive, the polynomial will have positive values for every *x*-value in the interval.

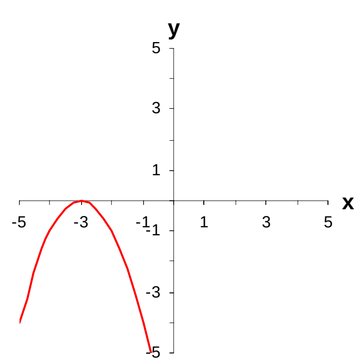
To check the solution of the polynomial inequality $3x^2 + 2x - 5 < 0$ with a graph, . . . graph the associated polynomial equation $y = 3x^2 + 2x - 5$ and locate the portion of the graph that is below the x-axis.

If a polynomial inequality is not given in general form, you should begin the solution process by . . . writing the inequality in general form—with the polynomial on one side and zero on the other side.

Example 1: Solve $x^2 + x - 20 \geq 0$ and graph the solution set.
$(-\infty, -5] \cup [4, \infty)$



Example 2: Use a graph to solve the polynomial inequality $-x^2 - 6x - 9 > 0$.
$\varnothing$



II. Rational Inequalities (Page 201)

What you should learn
How to solve rational inequalities

To extend the concepts of critical numbers and test intervals to rational inequalities, use the fact that the value of a rational expression can change sign only at its ______zeros______ and its ______undefined values______. These two types of numbers make up the ______critical numbers______ of a rational inequality.

Name____

To solve a rational inequality, . . . first write the rational inequality in general form. Then find the zeros and undefined values of the resulting rational expression. Form the appropriate test intervals and test a point from each interval in the inequality. Select the test intervals that satisfy the inequality as the solution set.

Example 3: Solve $\frac{3x+15}{x-2} \le 0$ and graph the solution set.

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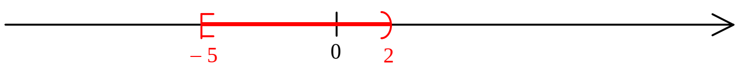


III. Applications of Other Inequalities (Pages 202–203)

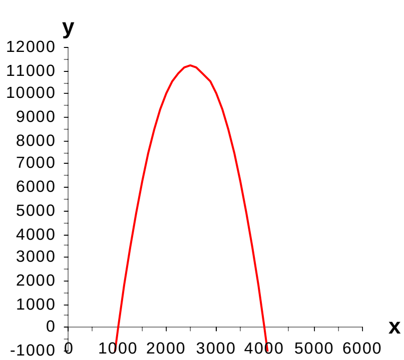
What you should learn
How to use inequalities to model and solve real-life problems

A formula that relates profit, revenue, and cost is

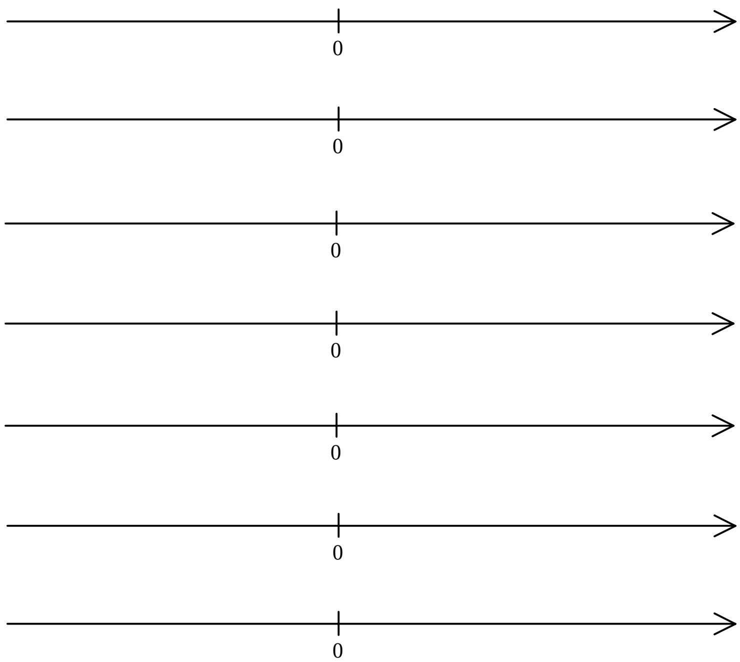
Profit = Revenue – Cost.

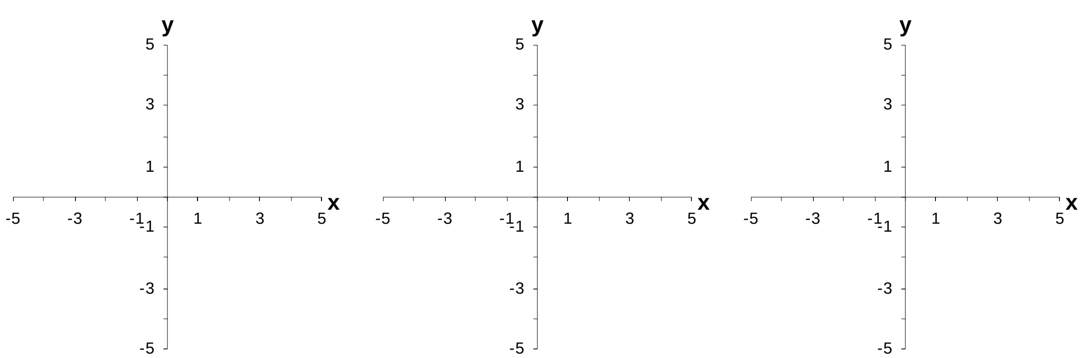
Example 4: Let the revenue for a product be given by $R = x(30 - 0.005x)$ and the cost for the same product be given by $C = 5x + 20{,}000$, where R and C are measured in dollars and x represents the number of units sold. How many units must be sold to obtain a positive profit?

$1000 < x < 4000$



Additional notes





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