

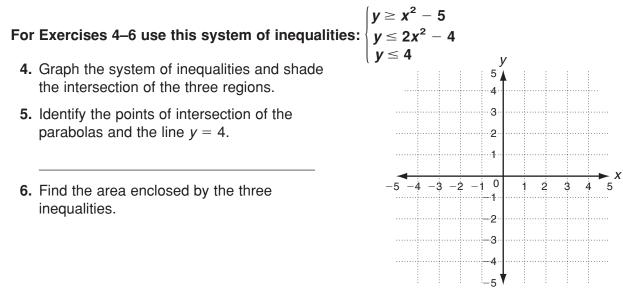
Areas Defined by Inequalities 5-7

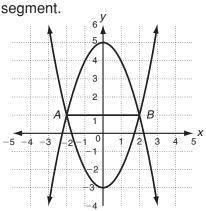
The area inside a parabola bounded by a horizontal line segment is given by the formula $A = \frac{2}{3}bh$, where b is the length of the line segment and h is the vertical distance from the vertex of the parabola to the line segment.

Consider the region bounded by the curves $y = 5 - x^2$ and $y = x^2 - 3$. This region is shown in the graph at right.

To find the area of the region bounded by the curves, you need to know the length of the horizontal line segment AB.

- 1. Adapt the substitution method for systems of linear equations to find the coordinates of the intersection points of the parabolas. What are the coordinates of A and B?
- 2. What is the length of line segment AB?
- 3. Find the area enclosed by each parabola and line segment AB. Use this data to find the area bounded between the two curves.





Name

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5-7 Solving Quadratic Inequalities (continued)	57 Areas Defined by Inequalities
You can use algebra to solve quadratic inequalities.	The area inside a parabola bounded by a horizontal line segment is given by the formula $A = \frac{2}{3}bh$, where <i>b</i> is the length of the line segment and <i>h</i> is
Solve the inequality $x^2 - 2x - 5 \le 3$.	the vertical distance from the vertex of the parabola to the line segment.
Step 1 Write the related equation. $x^2 - 2x - 5 = 3$ Step 2 Solve the equation.	Consider the region bounded by the curves
	$y = 5 - x^2$ and $y = x^2 - 3$. This region is shown
$x^2 - 2x - 8 = 0$ (x - 4)(x + 2) = 0 Write the equation in standard form. Then factor to solve for x.	in the graph at right.
(x - 4) = 0 or $(x + 2) = 0$	To find the area of the region bounded by the curves, you need to know the length of the horizontal line
x = 4 or x = -2 These solutions are called critical values.	segment AB. -5 - 4 - 3 - 2 - 1 0 1/2 3 4 5
Step 3 Use the critical values to write three intervals.	
Intervals: $x \le -2, -2 \le x \le 4, x \ge 4$	1. Adapt the substitution method for systems of linear equations to find the coordinates of the intersection
Step 4 Using the inequality, test a value for x in each interval.	points of the parabolas. What are the coordinates of A and B?
$x^2 - 2x - 5 \le 3$	(-2, 1), (2, 1)
$x \le -2$: Try $-3. (-3)^2 - 2(-3) - 5 \le 3$?	2. What is the length of line segment AB? 4 units
$10 \le 3$ False.	
$-2 \le x \le 4$: Try 0. $(0)^2 - 2(0) - 5 \le 3$?	 Find the area enclosed by each parabola and line segment AB. Use this data to find the area bounded between the two curves.
$-5 \le 3$ True.	
x \ge 4: Try 5. (5) ² - 2(5) - 5 \le 3? 10 \le 3 False. Use closed circles when the	The area enclosed between the segment and each parabola is $\frac{32}{3}$ square
Step 5 Shade the solution on a number line. Step 5 Shade the solution of a number line.	units so the area bounded by both parabolas is $\frac{64}{3}$ square units.
Use open circles when the	$y \ge x^2 - 5$
$\underbrace{\begin{array}{c cccccccccccccccccccccccccccccccccc$	For Exercises 4–6 use this system of inequalities: $y \le 2x^2 - 4$
Solve each inequality. Graph the solution on the number line.	4. Graph the system of inequalities and shade $y \le 4$
3. $x^2 - 2x + 1 \ge 4$ 4. $x^2 + x + 4 < 6$	the intersection of the three regions.
Solve: $x^2 - 2x - 3 = 0$. Solve: $x^2 + x - 2 = 0$	5. Identify the points of intersection of the parabolas and the line $y = 4$.
	(-3, 4), (-2, 4), (2, 4), (3, 4)
Critical values: Critical values:2, 1	6. Find the area enclosed by the three $-5 - 4 - 3 + 1 + 0 + 1 + 2 + 3 + 5$
Test x-values:	inequalities.
$x \le -1 \text{ or } x \ge 3$ $-2 < x < 1$	Area = $\frac{108}{3} - \frac{64}{3} = \frac{44}{3}$ square units
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Copyright © by Holt, Rinehart and Winston. 55 Holt Algebra 2	Copyright & by Holt, Rinehart and Winston. 56 Holt Algebra 2
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5-7 Solving Quadratic Inequalities The manager at Travel Tours is proposing a fall tour to Australia and New Zealand. He works out the details and finds that the profit	You can graph quadratic inequalities just as you can graph linear
5-7 Solving Quadratic Inequalities The manager at Travel Tours is proposing a fall tour to Australia and New Zealand. He works out the details and finds that the profit <i>P</i> for <i>x</i> persons is $P(x) = -28x^2 + 1400x - 3496$. The owner of Travel Tours has decided that the tour will be canceled if the profit is	You can graph quadratic inequalities just as you can graph linear inequalities. The solution of a quadratic inequality is a region in the plane. The graph of $y = x^2 + 1$ is shown below. Its curve describes the boundary
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 57 Solving Quadratic Inequalities The manager at Travel Tours is proposing a fail tour to Australia and New Zealand. He works out the details and finds that the profit P for x persons is P(x) = -28x⁴ + 1400x - 3496. The owner of Travel Tours has decided that the tour will be canceled if the profit is less than \$10,000. 1. a. Write an inequality that you could use to find the number of people needed to make the tour possible. b. Solve the related equation to find the critical values. c. Test an x-value in each interval. 2. Test an x-value in each interval. 2. Test an x-value in each interval. a. How many people will Travel Tours need to make the tour possible? c. How many people will Travel Tours need to make a profit of at least \$12,000 for the tour to be possible. What effect will this have on the range of people able to take this tour? Possible answer: The range is narrower. There must be between 17 and 33 people to take the tour. The manager plans a tour to the Fiji Islands and determines that the profit P for x persons is P(x) = -40x² + 1920x - 3200. Choose the letter for the best answer. a. In order to make \$10,000 profit, how many people will take for this tour to happen? A. Between 9 and 39 people B. Between 14 and 36 people 	Solution of the solution region of which inequality? Write another solution of the solution o
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