

**9-9**

# Using the Quadratic Formula and the Discriminant

Use a calculator to explore quadratic equations of the form  $ax^2 + bx + c = 0$ .

- Graph the related function for each of the quadratic equations in the table to determine how many real solutions each equation has. Then complete the table as shown.

Quadratic Equation	Number of Real Solutions	$a$	$b$	$c$	$b^2 - 4ac$	Is $b^2 - 4ac$ positive, negative, or zero?
$x^2 + 2x - 8 = 0$	2	1	2	-8	36	Positive
$x^2 - 8x + 16 = 0$						
$x^2 + 6x + 11 = 0$						
$2x^2 + 3x + 3 = 0$						
$4x^2 - 8x + 3 = 0$						
$4x^2 + 4x + 1 = 0$						

- Look for a relationship between the number of real solutions and the value of  $b^2 - 4ac$ . What do you notice?

## THINK AND DISCUSS

- Discuss** what you can conclude about a quadratic equation for which  $b^2 - 4ac > 0$ .
- Explain** what you know about the value of  $b^2 - 4ac$  for a quadratic equation that has exactly one real solution.

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$x^2 + 2x - 8 = 0$	2	1	2	-8	36	Positive
$x^2 - 8x + 16 = 0$	1	1	-8	16	0	Zero
$x^2 + 6x + 11 = 0$	0	1	6	11	-8	Negative
$2x^2 + 3x + 3 = 0$	0	2	3	3	-15	Negative
$4x^2 - 8x + 3 = 0$	2	4	-8	3	16	Positive
$4x^2 + 4x + 1 = 0$	1	4	4	1	0	Zero

- Look for a relationship between the number of real solutions and the value of  $b^2 - 4ac$ . What do you notice?

## THINK AND DISCUSS

- Discuss** what you can conclude about a quadratic equation for which  $b^2 - 4ac > 0$ . **The equation has 2 real solutions.**
- Explain** what you know about the value of  $b^2 - 4ac$  for a quadratic equation that has exactly one real solution.
- 2 real solutions if  $b^2 - 4ac > 0$ ; 1 real solution if  $b^2 - 4ac = 0$ ; no real solutions if  $b^2 - 4ac < 0$**
- $b^2 - 4ac = 0$**