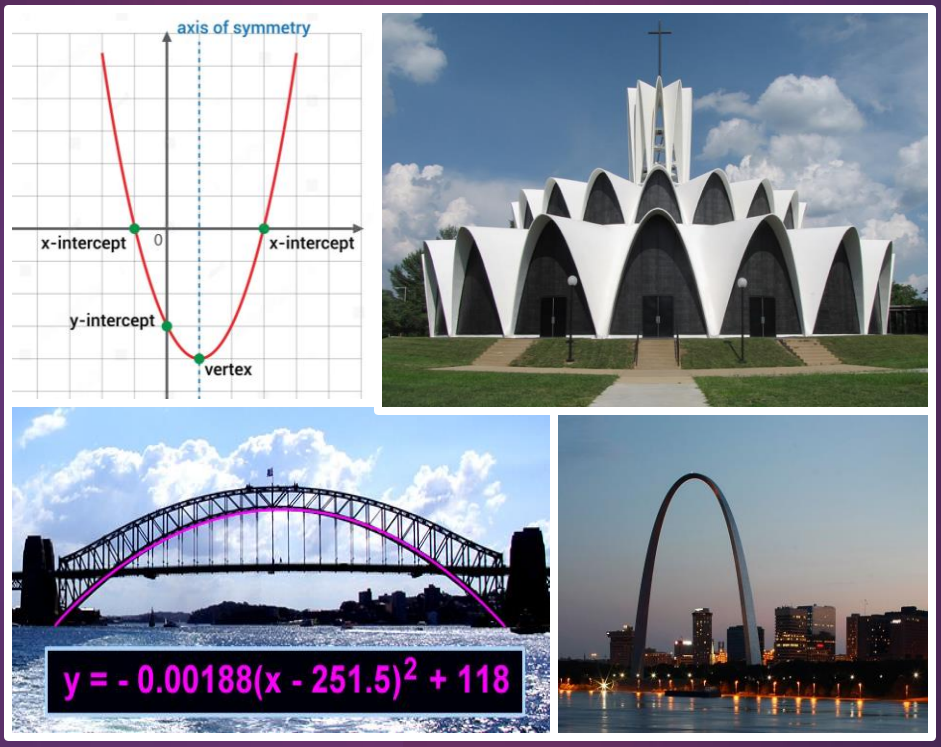
Fun Learning

MATHEMATICS

WORKTEXT



Quadratic Equations • Parabola

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CONTENT

1. Characterizing the roots of a Quadratic Equation using the Discriminant. (M9AL-Ic-1)

Interactive Quiz

2. Describing the Relationship between the coefficients and the sum and product of the roots of a Quadratic Equation. (M9AL-Ic-2)

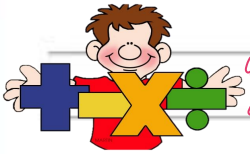
Interactive Quiz

3. Analyzing the effects of changing the values of a, h and k in the equation $y=a(x-h)^2+k$ of a quadratic function on its graph. (M9AL-Ii-2)

Interactive Quiz

4. Solving problems involving quadratic functions.

Interactive Quiz



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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Essential Concept

In the Quadratic formula $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$, the radicand $b^2 - 4ac$ is the Discriminant.

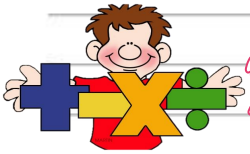
Thus, D = $b^2 - 4ac$.

To characterize the roots of a Quadratic Equation, here's to consider:

Value of Discriminant	Nature/Characteristics of the Roots
D < 0	Imaginary/complex
D = 0	Real, equal
D > 0 D is a perfect square	Rational, unequal
D > 0 D is a non-perfect square	Irrational, unequal

Steps:

1. Transform the Quadratic Equation into General Form $ax^2 + bx + c = 0$.
2. Identify the values *a*, *b*, and *c* in the Quadratic Equation.
3. Evaluate the Discriminant, D = $b^2 - 4ac$.
4. Determine the nature/characteristics of the roots.



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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Example:

Characterize the roots of the following Quadratic Equations using the Discriminant.

1. $x^2 + 6x = -9$

Solution:

Step 1: Transform

$x^2 + 6x = -9$

$x^2 + 6x + 9 = -9 + 9$

$x^2 + 6x + 9 = 0$ General Form

Step 2: Identify *a*, *b*, *c*

$x^2 + 6x + 9 = 0$

a = 1 b = 6 c = 9

Step 3: Evaluate D = $b^2 - 4ac$

a = 1 b = 6 c = 9

D = $b^2 - 4ac$

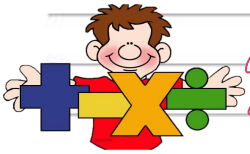
D = $6^2 - 4(1)(9)$

D = 36 – 36

D = 0

Step 4: Determine the nature of the roots

Since D = 0, therefore the roots are **Real and equal.**



1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Example:

Characterize the roots of the following Quadratic Equations using the Discriminant.

2. $-2x^2 + 3x = 2$

Solution:

Step 1: Transform

$-2x^2 + 3x = 2$

$-2x^2 + 3x - 2 = 2 - 2$

$-2x^2 + 3x - 2 = 0$ General Form

Step 2: Identify *a*, *b*, *c*

$-2x^2 + 3x - 2 = 0$

a = -2 b = 3 c = -2

Step 3: Evaluate D = $b^2 - 4ac$

a = -2 b = 3 c = -2

D = $b^2 - 4ac$

D = $3^2 - 4(-2)(-2)$

D = 9 – 16

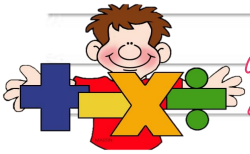
D = -7

Step 4: Determine the nature of the roots

Since D = -7, and

-7 < 0, so

D < 0, therefore the roots are **Imaginary/Complex**



1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Example:

Characterize the roots of the following Quadratic Equations using the Discriminant.

3. $x^2 - 5 = 4x$

Solution:

Step 1: Transform

$x^2 - 5 = 4x$

$x^2 - 5 - 4x = 4x - 4x$

$x^2 - 4x - 5 = 0$ General Form

Step 2: Identify *a*, *b*, *c*

$x^2 - 4x - 5 = 0$

a = 1 b = -4 c = -5

Step 3: Evaluate D = $b^2 - 4ac$

a = 1 b = -4 c = -5

D = $b^2 - 4ac$

D = $(-4)^2 - 4(1)(-5)$

D = 16 + 20

D = 36

Step 4: Determine the nature of the roots

Since D = 36, and

36 > 0, also 36 is a perfect square

D > 0, D is a perfect square

therefore the roots are

Rational and unequal

Quiz

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

I. Let' do this together!

A. Transform to a better form!

Identify the correct transformation of Quadratic Equation into the General form.

1. $2x^2 - x = 1$

a. $2x^2 - x + 1 = 1 + 1 \rightarrow 2x^2 - x + 1 = 0$

b. $2x^2 - x - 1 = 1 - 1 \rightarrow 2x^2 - x - 1 = 0$

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

I. Let' do this together!

A. Transform to a better form!

Identify the correct transformation of Quadratic Equation into the General form.

2. $x^2 + 5 = -7x$

a. $x^2 + 5 + 7 = -7x + 7$
$\rightarrow x^2 + 7 + 5 = 0$

b. $x^2 + 5 + 7x = -7x + 7x$
$\rightarrow x^2 + 7x + 5 = 0$

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

I. Let' do this together!

A. Transform to a better form!

Identify the correct transformation of Quadratic Equation into the General form.

3. $-8x + 8 = -2x^2$

a. $-8x + 8 + 2x^2 = -2x^2 + 2$
$\rightarrow 2x^2 - 8x + 8 = 0$

b. $2x^2 - x - 1 = 1 - 1$
$\rightarrow 2x^2 - x - 1 = 0$

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

I. Let' do this together!

A. Transform to a better form!

Identify the correct transformation of Quadratic Equation into the General form.

4. $-x^2 - 4x = 5$

a. $-x^2 - 4x - 5 = 5 - 5$
$\rightarrow -x^2 - 4x - 5 = 0$

b. $-x^2 - 4x + 5 = 5 + 5$
$\rightarrow -x^2 - 4x + 5 = 0$

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

I. Let' do this together!

A. Transform to a better form!

Identify the correct transformation of Quadratic Equation into the General form.

5. $5x^2 + 3x = 6x - 1$

a. $5x^2 + 3x + 6x - 1 = 6x - 1 + 6x - 1$
$\rightarrow 5x^2 + 9x - 1 = 0$

b. $5x^2 + 3x - 6x + 1 = 6x - 1 - 6x + 1$
$\rightarrow 5x^2 - 3x + 1 = 0$

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

B. Know your value!

Identify the values of *a*, *b* and *c* of the Quadratic Equation.

1. $2x^2 - x - 1 = 0$

a. $a = 2$, $b = -1$, $c = -1$

b. $a = 2$, $b = 1$, $c = 1$

Fun Learning

1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

B. Know your value!

Identify the values of *a*, *b* and *c* of the Quadratic Equation.

2. $x^2 + 7x + 5 = 0$

a. $a = 0$, $b = 7$, $c = 5$

b. $a = 1$, $b = 7$, $c = 5$

Fun Learning

1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

B. Know your value!

Identify the values of *a*, *b* and *c* of the Quadratic Equation.

3. $2x^2 + 8x + 8 = 0$

a. $a = 2$, $b = -8$, $c = 8$

b. $a = 2$, $b = 8$, $c = 8$

Fun Learning

1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

B. Know your value!

Identify the values of *a*, *b* and *c* of the Quadratic Equation.

4. $-x^2 - 4x - 5 = 0$

a. *a* = -0, *b* = -4, *c* = -5

b. *a* = -1, *b* = -4, *c* = -5

Fun Learning

1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

B. Know your value!

Identify the values of *a*, *b* and *c* of the Quadratic Equation.

5. $5x^2 - 3x + 1 = 0$

a. $a = 5$, $b = 3$, $c = 1$

b. $a = 5$, $b = 3$, $c = 1$

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

C. Write what's right!

Evaluate the Discriminant (D = $b^2 - 4ac$) of the Quadratic Equation

1. $2x^2 - x - 1 = 0$

***a* = 2, *b* = -1, *c* = -1**

a.

$D = b^2 - 4ac$
$D = (-1)^2 - 4(2)(-1)$
$D = 1 - (-8)$
$D = 1 + 8$
$D = 9$

b.

$D = b^2 - 4ac$
$D = 2^2 - 4(-1)(-1)$
$D = 4 - 4$
$D = 0$

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

C. Write what's right!

Evaluate the Discriminant (D = $b^2 - 4ac$) of the Quadratic Equation

2. $x^2 + 7x + 5 = 0$

$a = 1, b = 7, c = 5$

a.

$D = b^2-4ac$
$D = 1^2-4(7)(5)$
$D = 1-140$
$D = -139$

b.

$D = b^2-4ac$
$D = 7^2-4(1)(5)$
$D = 49-20$
$D = 29$

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

C. Write what's right!

Evaluate the Discriminant (D = $b^2 - 4ac$) of the Quadratic Equation

3. $2x^2 - 8x + 8 = 0$

$a = 2, b = -8, c = 8$

a.

$D = b^2-4ac$
$D = 8^2-4(2)(8)$
$D = 16-64$
$D = -48$

b.

$D = b^2-4ac$
$D = (-8)^2-4(2)(8)$
$D = 64-64$
$D = 0$

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1 Characterizing the roots of a Quadratic Equation using the Discriminant.

Exercises:

C. Write what's right!

Evaluate the Discriminant (D = $b^2 - 4ac$) of the Quadratic Equation

3. $2x^2 - 8x + 8 = 0$

$a = 2, b = -8, c = 8$

a.

$D = b^2-4ac$
$D = 8^2-4(2)(8)$
$D = 16-64$
$D = -48$

b.

$D = b^2-4ac$
$D = (-8)^2-4(2)(8)$
$D = 64-64$
$D = 0$