

Aim: how can we determine the nature of the roots of a quadratic equation?

Do Now:

What are the roots of the equation $x^2 + 4x - 16 = 0$?

- (1) $2 \pm 2\sqrt{5}$ (3) $2 \pm 4\sqrt{5}$
 (2) $-2 \pm 2\sqrt{5}$ (4) $-2 \pm 4\sqrt{5}$

Hint: use the quadratic formula

Which equation has the same solution as $x^2 - 6x - 12 = 0$?

- (1) $(x + 3)^2 = 21$ (3) $(x + 3)^2 = 3$
 (2) $(x - 3)^2 = 21$ (4) $(x - 3)^2 = 3$

Hint: use completing the square method

I – The Discriminant

1)

The **discriminant** is the name given to the expression that appears under the square root (radical) sign in the quadratic formula.



Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Discriminant

$$b^2 - 4ac$$

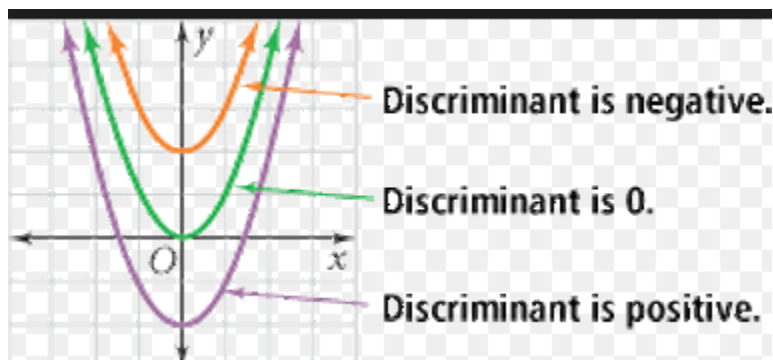
2) For Example

Find the value of the discriminant of each quadratic equation.

1) $6p^2 - 2p - 3 = 0$

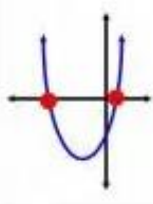
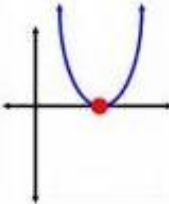
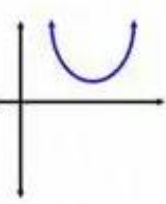
2) $-2x^2 - x - 1 = 0$

3) The discriminant can tell us about the nature of the roots



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4)

| Discriminant of $ax^2 + bx + c = 0$ | | | |
|-------------------------------------|---|---|--|
| | $b^2 - 4ac > 0$ | $b^2 - 4ac = 0$ | $b^2 - 4ac < 0$ |
| Graph of $y = ax^2 + bx + c$ |  |  |  |
| Number of Solutions | TWO | ONE | NONE |

II – The roots and the nature of the roots

Example1:

Write the nature of roots of $2x^2 + 3x - 5 = 0$

Example2:

Write the nature of roots of $2x^2 + 3x - 4 = 0$

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Example3:

Write the nature of roots of $2x^2 + 3x + 5 = 0$

Example4:

Write the nature of roots of $2x^2 - 4x + 2 = 0$

[Note: Discriminant Calculator](#)

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Homework # 11

1. Which equation has two real, irrational solutions?

- A. $(x-2)^2 = -1$
- B. $(x+5)^2 = 0$
- C. $(x+8)^2 = 49$
- D. $(x+6)^2 = 43$

2. The coefficients of a quadratic equation are all integers. The discriminant is 0. Which statement best describes its roots?

- A. Two irrational roots
- B. No real roots
- C. One rational root
- D. Two rational roots

3. If the discriminant of a quadratic equation is greater than zero, there is/are:

- A. 1 real root
- B. 2 real roots
- C. no solution
- D. none of the above

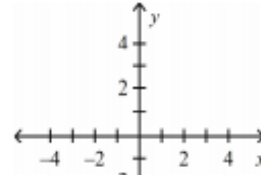
4. Find the value of the discriminant. Then describe the number and type of roots for

$$3x^2 - 6x + 2 = 0$$

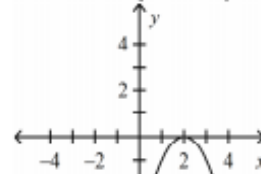
- A. Since the discriminant is greater than 0 and is a perfect square, the two roots are real and rational.
- B. Since the discriminant is greater than 0 and is not a perfect square, the roots are real and irrational.
- C. Since the discriminant is less than 0, the roots are non-real.
- D. Since the discriminant is equal to 0, the roots are equal and real.

5. Which of the following represents a graphical approach to solving a quadratic equation with *two* integral solutions?

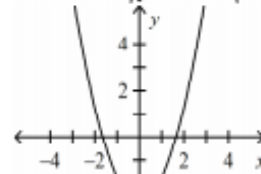
A.



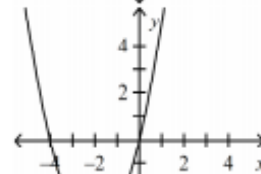
B.



C.



D.



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6. The quadratic equation $2x^2 + 10x + d = 0$ has only one root. Use the discriminant to determine the value of d .
7. Solve $-11x^2 - 5x - 4 = 0$
8. Solve $-2x^2 + 10x + 11 = 0$
9. Solve $8x^2 - 5x + 3 = 0$
10. Solve $-2x^2 - 7x = 0$
11. The quadratic equation $2x^2 - 4x + d = 0$ has only one root. Use the discriminant to determine the value of d .
12. Solve $x^2 - 4x + 3 = 0$
13. Solve $-10x^2 + 5x + 4 = 0$
14. Determine the discriminant of the equation $10x^2 - 15x - 70 = 0$
15. Solve $3x^2 + 2x - 4 = 0$

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Answers to Homework # 11

Please select the correct answers number for each question. There are more answers than questions.
Answers may be repeated.

1. A

2. B

3. C

4. D

5. 2

6. $x = \frac{-1 \pm \sqrt{13}}{3}$

7. 0 or $-\frac{7}{2}$

8. 12.5

9. 3025

10. 1 or $\frac{5}{6}$

11. 1 or 3

12. No real roots

13. $x = \frac{5 \pm \sqrt{47}}{2}$

14. $x = \frac{5 \pm \sqrt{185}}{20}$

15. 1849

16. -2 or $\frac{5}{6}$