

AII.4b - The Quadratic Formula and Discriminant

The Discriminant:

1) What is the formula for the discriminant?

$$b^2 - 4ac$$

2) What does the discriminant tell us about an equation?

how many solutions

3) Based on the given discriminants, what do you know about the equation related to it?

a. 8 2 sol.

d. 1 2 sol.

b. -10 0 sol.

e. 0 1 sol.

c. 9 2 sol.

f. -4 0 sol.

Quadratic Formula:

4) What is the quadratic formula?

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

5) Why do we use the quadratic formula? What are the benefits of solving a quadratic equation by the quadratic formula over the other methods we have?

always works

For each equation below A) find the discriminant and determine the type of solutions and B) solving each equation using the quadratic formula.

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

A) $D = -32 \rightarrow 0$ solutions

B) **no solutions**

7. $3x^2 - 3x + 12 = 0$

A) $D = -135 \rightarrow 0$ solutions

B) **no solutions**

8. $8x^2 - 4 = 0$

A) $D = 128 \rightarrow 2$ solutions

B) $x = \frac{0 \pm \sqrt{128}}{2(8)} = \pm \frac{8\sqrt{2}}{16} = \pm \frac{\sqrt{2}}{2}$

9. $-4x^2 - 4x + 15 = 0$

A) $D = 256 \rightarrow 2$ solutions

B) $x = \frac{4 \pm \sqrt{256}}{2(-4)} = \frac{4 \pm 16}{-8}$

$x = \frac{20}{-8} = -\frac{5}{2}$ and $x = \frac{-12}{-8} = \frac{3}{2}$

10. $12x = -18x - 2x^2 \rightarrow 2x^2 + 30x = 0$

A) $D = 900 \rightarrow 2$ solutions

B) $x = \frac{-30 \pm \sqrt{900}}{2(2)} = \frac{-30 \pm 30}{4}$

$x = \frac{-60}{4} = -15$ and $x = \frac{0}{4} = 0$

11. $-10x^2 = 45x \rightarrow 10x^2 + 45x = 0$

A) $D = 2025 \rightarrow 2$ solutions

B) $x = \frac{-45 \pm \sqrt{2025}}{2(10)} = \frac{-45 \pm 45}{20}$

$x = \frac{-45+45}{20} = \frac{0}{20} = 0$ and $x = \frac{-45-45}{20} = \frac{-90}{20} = -\frac{9}{2}$

12. $2 = -10x + 25x^2 + 20 \rightarrow 25x^2 - 10x + 18 = 0$

A) $D = -1700 \rightarrow 0$ solutions

B) **no solutions**

13. $3x^2 = -4x + 10 \rightarrow 3x^2 + 4x - 10 = 0$

A) $D = 136 \rightarrow 2$ solutions

B) $x = \frac{-4 \pm \sqrt{136}}{2(3)} = \frac{-4 \pm \sqrt{136}}{6}$

14. $1 = -10x + 7x^2 \rightarrow 7x^2 - 10x - 1 = 0$

A) $D = 128 \rightarrow 2$ solutions

B) $x = \frac{10 \pm \sqrt{128}}{2(7)} = \frac{10 \pm 8\sqrt{2}}{14}$

$= \frac{10}{14} \pm \frac{8\sqrt{2}}{14} = \frac{5}{7} \pm \frac{4\sqrt{2}}{7} = \frac{5 \pm 4\sqrt{2}}{7}$

15. $3x^2 - 10x + 22 = 0$

A) $D = -164 \rightarrow 0$ solutions

B) **no solutions**