True or False?

the quadratic formula

Question 1

The quadratic formula can only be applied to equations in the form $ax^2 + bx + c = 0$ where $a \neq 0$.

Answer: FALSE

Explanation: True. The quadratic formula requires $a \neq 0$ because if $a = 0$, the equation becomes linear, not quadratic, and the formula would involve division by zero.

Question 2

If the discriminant of a quadratic equation is negative, the equation has two distinct real roots.

Answer: FALSE

Explanation: False. A negative discriminant indicates that the quadratic equation has two complex conjugate roots, not real roots.

Question 3

The quadratic formula gives the exact same solutions as completing the square method for any quadratic equation.

Answer: FALSE

Explanation: True. Both methods are algebraically equivalent and will yield identical solutions for any quadratic equation.

Question 4

For the quadratic equation $2x^2 - 8x + 8 = 0$, the quadratic formula gives $x = 2$ as the only solution.

Answer: FALSE

Explanation: True. The discriminant is $(-8)^2 - 4(2)(8) = 64 - 64 = 0$, indicating one repeated real root, which is $x = 2$.

Question 5

The quadratic formula can be used to solve cubic equations by applying it three times.

Answer: FALSE

Explanation: False. The quadratic formula is specifically designed for quadratic equations (degree 2). Cubic equations (degree 3) require different methods like Cardano's formula or factoring techniques.

Question 6

In the quadratic formula $x = [-b \pm \sqrt{(b^2 - 4ac)}]/(2a)$, the ± symbol means both addition and subtraction must be used to find the two roots.

Answer: FALSE

Explanation: True. The ± symbol indicates that there are two solutions: one using the positive square root and one using the negative square root.

Question 7

If a quadratic equation has rational coefficients and the discriminant is a perfect square, then the roots must be rational numbers.

Answer: FALSE

Explanation: True. When the discriminant is a perfect square, the square root becomes a rational number, and combined with rational coefficients, this ensures rational roots.

Question 8

The quadratic formula works for quadratic equations with complex coefficients.

Answer: FALSE

Explanation: True. The quadratic formula is valid for any complex coefficients, though the interpretation of roots and discriminant becomes more involved in the complex plane.

Question 9

For the equation $x^2 + 4x + 5 = 0$, the quadratic formula gives real number solutions.

Answer: FALSE

Explanation: False. The discriminant is $4^2 - 4(1)(5) = 16 - 20 = -4$, which is negative, so the solutions are complex numbers: $x = -2 \pm i$.

Question 10

The quadratic formula can be derived from the method of completing the square.

Answer: FALSE

Explanation: True. The standard derivation of the quadratic formula involves completing the square on the general quadratic equation $ax^2 + bx + c = 0$.

Question 11

If $b = 0$ in a quadratic equation, the quadratic formula simplifies to $x = \pm\sqrt{(-c/a)}$.

Answer: FALSE

Explanation: True. When $b = 0$, the equation becomes $ax^2 + c = 0$, and the quadratic formula simplifies to $x = \pm\sqrt{(-c/a)}$, provided $a \neq 0$.

Question 12

The quadratic formula always gives two distinct solutions for any quadratic equation.

Answer: FALSE

Explanation: False. When the discriminant is zero, the quadratic formula gives one repeated real root (a double root), not two distinct solutions.

Question 13

For the equation $3x^2 - 12x + 12 = 0$, the quadratic formula yields $x = 2$ as the only solution.

Answer: FALSE

Explanation: True. The discriminant is $(-12)^2 - 4(3)(12) = 144 - 144 = 0$, so there is one repeated root: $x = 12/(2\times3) = 2$.

Question 14

The quadratic formula can be used to solve quadratic inequalities by analyzing the sign of the expression.

Answer: FALSE

Explanation: False. While the quadratic formula finds roots, solving inequalities requires additional analysis of intervals and sign charts, not just the formula itself.

Question 15

If the quadratic equation has no real roots, then the parabola represented by the equation does not intersect the x-axis.

Answer: FALSE

Explanation: True. The roots of a quadratic equation correspond to the x-intercepts of its parabola. No real roots means the parabola does not cross the x-axis.

Question 16

The quadratic formula gives the vertex coordinates of the parabola represented by the quadratic equation.

Answer: FALSE

Explanation: False. The quadratic formula finds the roots (x-intercepts), while the vertex is found using $x = -b/(2a)$ and then substituting to find the y-coordinate.

Question 17

For any quadratic equation, the sum of the roots obtained from the quadratic formula equals -b/a.

Answer: FALSE

Explanation: True. This is Vieta's formula: for $ax^2 + bx + c = 0$, the sum of roots is -b/a, which can be verified from the quadratic formula solutions.

Question 18

The quadratic formula can be applied to equations of the form $ax^2 + bx = 0$ without rewriting them in standard form.

Answer: FALSE

Explanation: False. The quadratic formula requires the equation to be in standard form $ax^2 + bx + c = 0$. For $ax^2 + bx = 0$, $c = 0$, but it must still be written with all terms on one side equal to zero.

Question 19

If a quadratic equation has one rational root and one irrational root, then the discriminant must be a perfect square.

Answer: FALSE

Explanation: False. If one root is rational and the other irrational, the discriminant cannot be a perfect square because that would make both roots rational when coefficients are rational.

Question 20

The quadratic formula is valid for all real values of a, b, and c as long as $a \neq 0$.

Answer: FALSE

Explanation: True. The quadratic formula works for any real numbers a, b, c with $a \neq 0$, producing real or complex roots depending on the discriminant.