ILLAWARRA TUTORING

In this worksheet you will learn to use the quadratic formula to determine the real roots of quadratic equations with confidence.

Easy Questions

1. Write down the quadratic formula for solving a quadratic equation of the form $ax^2 + bx + c = 0$.
2. Solve the equation $x^2 - 5x + 6 = 0$ using the quadratic formula.
3. Solve the equation $x^2 + 4x + 4 = 0$ using the quadratic formula.
4. Solve the equation $2x^2 - 8x + 6 = 0$ using the quadratic formula.
5. Solve the equation $x^2 + x + 1 = 0$ using the quadratic formula. What happens?

Intermediate Questions

6. Solve the equation $3x^2 - 2x - 8 = 0$ using the quadratic formula.
7. Solve the equation $5x^2 - 20x + 15 = 0$ using the quadratic formula.
8. Solve the equation $4x^2 + 4x + 1 = 0$ using the quadratic formula.
9. Solve the equation $7x^2 - 3x + 2 = 0$ using the quadratic formula.
10. Solve the equation $6x^2 + x - 2 = 0$ using the quadratic formula.
11. Solve the equation $2x^2 + 3x + 1 = 0$ using the quadratic formula.
12. Solve the equation $-2x^2 + 4x + 6 = 0$ using the quadratic formula.
13. Solve the equation $x^2 - 10x + 25 = 0$ using the quadratic formula.
14. Solve the equation $3x^2 + 6x + 2 = 0$ using the quadratic formula.
15. Solve the equation $8x^2 - 2x - 3 = 0$ using the quadratic formula.
16. Solve the equation $5x^2 + 3x - 2 = 0$ using the quadratic formula.
17. Solve the equation $6x^2 - 11x + 4 = 0$ using the quadratic formula.
18. Solve the equation $2x^2 - 7x + 3 = 0$ using the quadratic formula.
19. Solve the equation $9x^2 + 4x - 1 = 0$ using the quadratic formula.
20. Solve the equation $12x^2 - 7x - 10 = 0$ using the quadratic formula.

Hard Questions

21. Prove the quadratic formula by completing the square for a general quadratic equation $ax^2 + bx + c = 0$. Write each step clearly.

22. A projectile is launched vertically and its height in metres at time t seconds is given by $-5t^2 + 20t + 3 = 0$. Determine the time when the projectile hits the ground. (Give the positive value of t.)

23. For what values of p does the quadratic equation $x^2 + px + 16 = 0$ have real roots? Use the quadratic formula conditions.

24. Find the roots of the equation $x^2 + 6x - 13 = 0$ using the quadratic formula.

25. Given the quadratic equation $4x^2 + 4(k-1)x + (k+2) = 0$, determine the value(s) of k for which the equation has exactly one real solution.

26. A rectangular garden has an area given by $A = x(20 - x)$, where x metres is the length of one side. Find the dimensions of the garden when the area is 96 square metres by forming and solving a quadratic equation using the quadratic formula.

27. Solve the equation $3(x-2)^2 + 4(x-2) - 5 = 0$ by making the substitution $y = x - 2$ and then using the quadratic formula.

28. Solve the equation $(2x+3)^2 - 5(2x+3) + 6 = 0$ using an appropriate substitution and the quadratic formula.

29. For the quadratic equation $5x^2 - 4x + k = 0$, find the value of k if one of the roots is double the other. (Hint: Let the roots be r and $2r$.)