

Quadratics with Complex Solutions

Grade 11 – Algebra 2 math · Worksheet · Standards: N-CN.C.7, A-REI.B.4b

Name: _____ Date: _____ Class: _____

These problems focus on quadratic equations whose solutions are complex numbers. They address Common Core standards N-CN.C.7 and A-REI.B.4b and rely on the discriminant, the quadratic formula, and completing the square.

Early problems classify equations and solve simple cases; later ones use fractions, parameters, graphs, and real-world models in which a quadratic never reaches a target value.

Standards: N-CN.C.7, A-REI.B.4b · **Level:** Grade 11 Algebra 2

Problem 1 Discriminant and type of solutions (easy)

Find the discriminant of each equation and state the number and type of solutions.

- a. $x^2 - 3x - 10 = 0$
- b. $x^2 - 8x + 16 = 0$
- c. $2x^2 + 3x + 4 = 0$
- d. $3x^2 - 2x - 7 = 0$

Problem 2 Solving with square roots (easy)

Solve each equation. Write the solutions in terms of i .

- a. $x^2 = -49$
- b. $x^2 + 36 = 0$
- c. $3x^2 + 75 = 0$

Problem 3 Solutions from a squared binomial (easy)

Solve each equation.

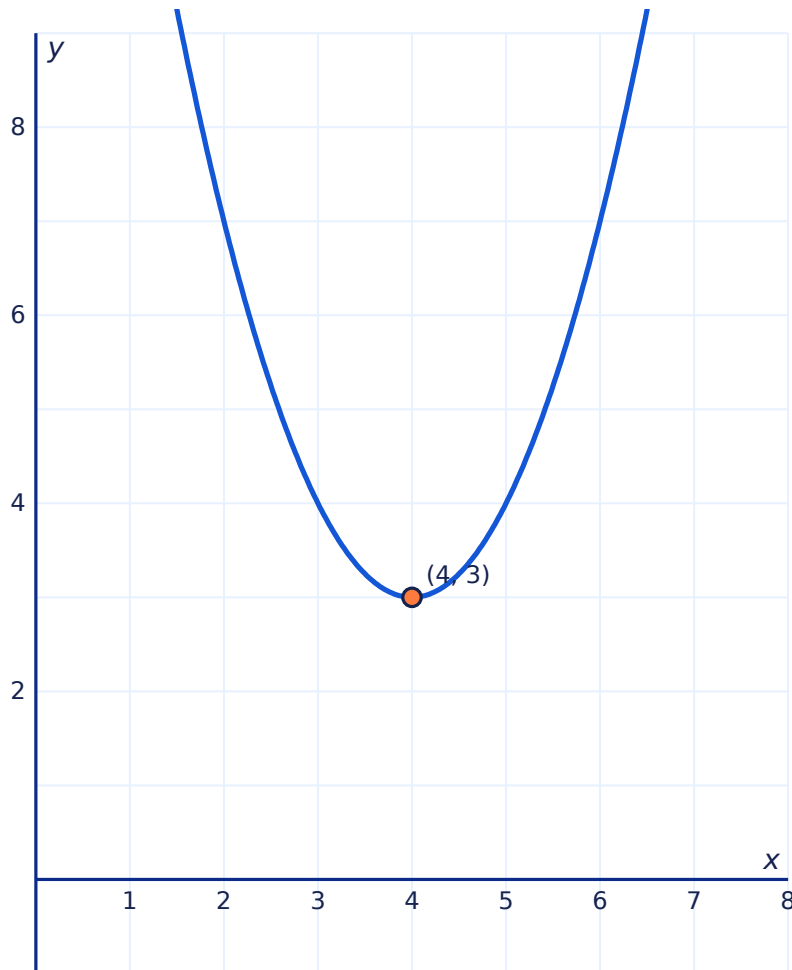
- a. $(x + 4)^2 = -25$
- b. $(x - 3)^2 + 49 = 0$

Problem 4 Quadratic formula with a negative discriminant (easy)

Use the quadratic formula to solve $x^2 + 10x + 41 = 0$.

Problem 5 Reading the graph (easy)

The graph of $y = x^2 - 8x + 19$ is shown. State how many real solutions $x^2 - 8x + 19 = 0$ has, give the sign of the discriminant, and find all solutions.



The graph never reaches the x-axis.

Problem 6 Completing the square (medium)

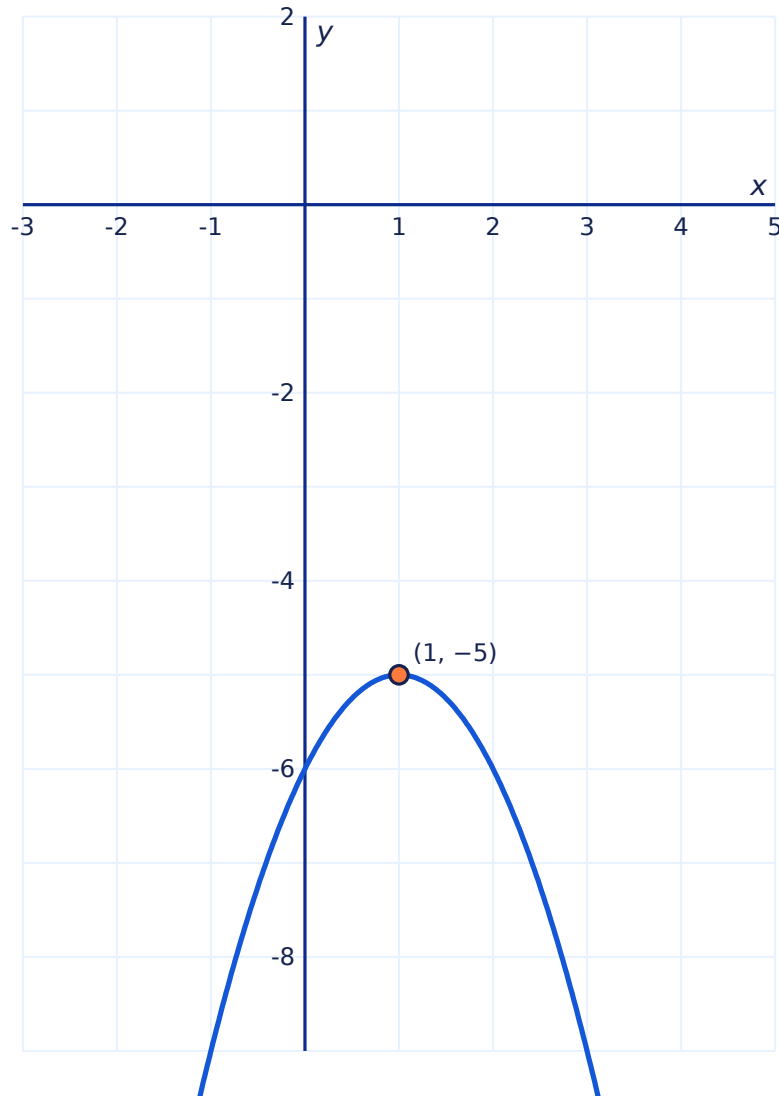
Solve $x^2 - 12x + 45 = 0$ by completing the square.

Problem 7 Fractions in the solution (medium)

Solve $3x^2 + 5x + 4 = 0$.

Problem 8 A parabola that opens downward (medium)

The graph of $y = -x^2 + 2x - 6$ is shown. Explain why the equation $-x^2 + 2x - 6 = 0$ has no real solutions, then solve it.



The parabola stays below the x-axis.

Problem 9 A solution with a reduced fraction (medium)

Solve $5x^2 - 4x + 1 = 0$.

Problem 10 Reducing a radical solution (medium)

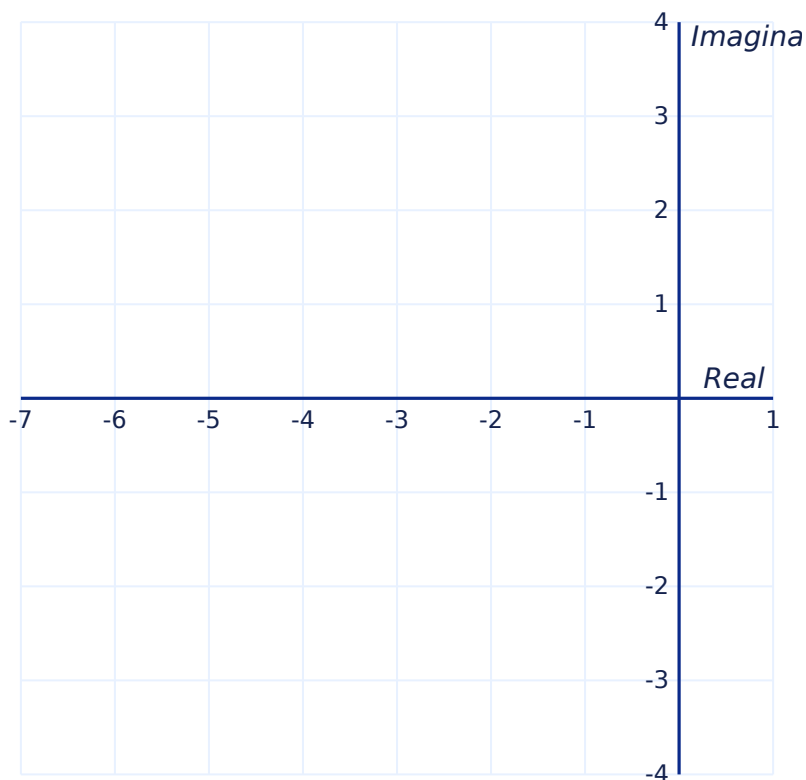
Solve $3x^2 - 6x + 10 = 0$ and write the answer in simplest form.

Problem 11 Choosing a constant (medium)

For which values of k does $x^2 - 8x + k = 0$ have non-real solutions? For which value does it have exactly one real solution?

Problem 12 Plotting complex solutions (medium)

Find both solutions of $x^2 + 6x + 18 = 0$, mark them as points on the complex-plane grid, and confirm the sum and product relationships between the solutions and the coefficients.



Grid for plotting.

Problem 13 Building an equation from solutions (medium)

Write a quadratic equation with real coefficients and leading coefficient 1 whose solutions are $7 + 2i$ and $7 - 2i$.

Problem 14 Which equations have non-real solutions (medium)

Without solving, decide which equations have non-real solutions.

- a. $x^2 - 5x + 7 = 0$
- b. $2x^2 - x - 6 = 0$
- c. $9x^2 - 12x + 4 = 0$
- d. $4x^2 + x + 3 = 0$

Problem 15 Completing the square with a leading coefficient (hard)

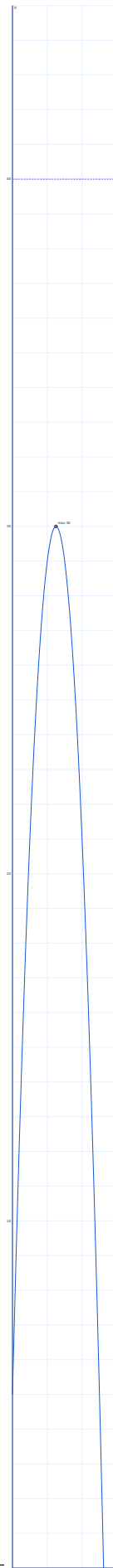
Solve each equation by completing the square.

a. $x^2 + 6x + 25 = 0$

b. $2x^2 - 12x + 26 = 0$

Problem 16 Will the ball reach the height? (hard)

A soccer ball kicked from a 5-foot platform has height $h(t) = -16t^2 + 40t + 5$ feet after t seconds. A banner hangs 40 feet above the ground. Show with the discriminant that the ball never reaches the banner, and find the complex solutions of $h(t) = 40$.



Problem 17 Profit that cannot happen (hard)

A school fundraiser models profit as $P(n) = -3n^2 + 36n - 90$ dollars when n hundred flyers are printed. Show that the profit can never reach \$100, and find the greatest possible profit.

Problem 18 Sum and product of solutions (hard)

Solve $2x^2 - 10x + 17 = 0$. Then find the sum and product of the solutions and compare with $-b/a$ and c/a .

Problem 19 Ranges of a parameter (hard)

For $x^2 + kx + 16 = 0$, find all values of k that give (a) non-real solutions, (b) one real solution, (c) two real solutions.

Problem 20 Finding a missing coefficient (hard)

One solution of $x^2 + bx + c = 0$, with b and c real, is $6 - 4i$. Find the other solution, b , and c .