

Quadratics with Complex Solutions

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

Solutions show every step with the scoring guide beneath. Give partial credit for correct setup. Final answers must be exact, simplified, and written with i instead of the square root of a negative number.

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

Question 1 Discriminants (2 points)

- a) $D = (-10)^2 - 4(1)(25) = 0$: **one repeated real solution.**
- b) $D = (1)^2 - 4(2)(-15) = 121$: **two distinct real solutions.**
- c) $D = (-2)^2 - 4(1)(8) = -28$: **two non-real complex solutions.**
- d) $D = (4)^2 - 4(4)(5) = -64$: **two non-real complex solutions.**

Scoring: 0.5 point per correct discriminant with its classification.

Question 2 Squared binomial equation (2 points)

$$x - 5 = \pm\sqrt{(-36)} = \pm 6i.$$

$$\mathbf{x = 5 \pm 6i}$$

Scoring: 1 point for $\pm 6i$, 1 point for the final solutions.

Question 3 Quadratic formula (3 points)

Here $a = 3$, $b = 2$, $c = 7$.

$$\text{Discriminant: } D = b^2 - 4ac = (2)^2 - 4(3)(7) = -80.$$

$D < 0$, so there are two non-real solutions. $\sqrt{(-80)} = 4i\sqrt{5}$.

$$x = \frac{-(-2) \pm \sqrt{(-80)}}{2(3)}$$

$$\mathbf{x = \frac{(-1 \pm 2i\sqrt{5})}{3}}$$

Scoring: 1 point for the discriminant, 1 for simplifying $\sqrt{D}$, 1 for the final reduced solutions.

Question 4 Completing the square (3 points)

$$x^2 + 8x = -41. \text{ Add 16: } (x + 4)^2 = -25.$$

$$x + 4 = \pm 5i.$$

$$x = -4 \pm 5i$$

Scoring: 1 point for the perfect-square form, 1 for the square root step, 1 for the solutions.

Question 5 Range of a constant (2 points)

$$D = 36 - 4k < 0 \text{ gives } k > 9.$$

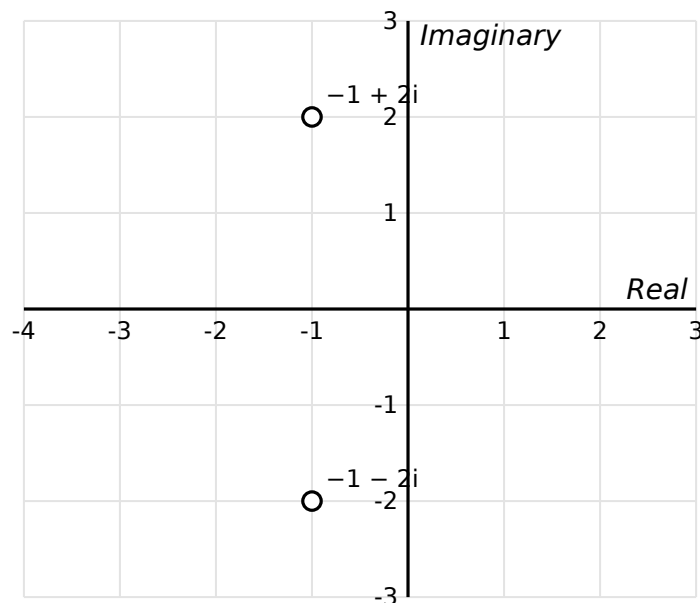
$$k > 9$$

Scoring: 1 point for D , 1 point for the inequality.

Question 6 A graph and its equation (2 points)

a) The vertex $(-1, 4)$ is above the x -axis and the parabola opens upward, so there are **no real solutions**.

b) $D = 4 - 20 = -16$, so $x = \frac{(-2 \pm 4i)}{2} = -1 \pm 2i$.



The two non-real solutions.

Scoring: 1 point each part.

Question 7 Writing an equation (3 points)

a) The conjugate: $2 - 7i$.

b) Sum = 4; product = $4 + 49 = 53$.

c) $x^2 - 4x + 53 = 0$

Scoring: 1 point each part.

Question 8 Will the drone reach the height? (3 points)

a) $-16t^2 + 20t + 6 = 15$ gives $16t^2 - 20t + 9 = 0$.

b) $D = (-20)^2 - 4(16)(9) = 400 - 576 = -176 < 0$: **the drone never reaches 15 feet** (maximum 12.25 feet).

c) $\sqrt{-176} = 4i\sqrt{11}$, so $t = \frac{(20 \pm 4i\sqrt{11})}{32} = \frac{(5 \pm i\sqrt{11})}{8}$.

Scoring: 1 point each part.