

## Quadratic Equation Worksheets (include complex solutions)

1. Compute the value of the discriminant of the quadratic equation in each part. Use the value of the discriminant to predict the number and type of solutions. Find all real and complex solutions.

a)  $x^2 + 2x + 1 = 0$

b)  $x^2 + 4 = 0$

c)  $3x^2 + 4x + 2 = 0$

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1. Compute the value of the discriminant of the quadratic equation in each part. Use the value of the discriminant to predict the number and type of solutions. Find all real and complex solutions.

a)  $x^2 + 2x + 1 = 0$

We have  $a = 1$ ,  $b = 2$ , and  $c = 1$ . Then

$$b^2 - 4ac = 2^2 - 4(1)(1) = 0.$$

Note that the discriminant is zero, so this equation has exactly one real solution.

$$x = \frac{-(2) \pm \sqrt{0}}{2(1)} = -1$$

Thus, the only solution is  $-1$ .

b)  $x^2 + 4 = 0$

We have  $a = 1$ ,  $b = 0$ , and  $c = 4$ . Then  $b^2 - 4ac = -16$ .

Note that the discriminant is negative, so this equation has two complex solutions.

$$x = \frac{-0 \pm \sqrt{-16}}{2(1)}$$

Thus, the two complex solutions are  $2i$  and  $-2i$ .

c)  $3x^2 + 4x + 2 = 0$

We have  $a = 3$ ,  $b = 4$ , and  $c = 2$ . Then

$$\begin{aligned} b^2 - 4ac &= 4^2 - 4(3)(2) \\ &= 16 - 24 \\ &= -8. \end{aligned}$$

The discriminant is negative, so there will be two complex solutions. Using the quadratic formula,

$$x = \frac{-4 \pm \sqrt{-8}}{2(3)}.$$

So, the two complex solutions are  $-\frac{2}{3} + \frac{\sqrt{2}}{3}i$  and  $-\frac{2}{3} - \frac{\sqrt{2}}{3}i$ .

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