

Exercise 7 Quadratic function and equations Quadratic function, quadratic equations

Objectives

- be able to determine the position of the vertex out of the vertex form of a quadratic function.
- be able to graph a quadratic function out of the vertex form.
- know and understand the relation between a quadratic function and a quadratic equation.
- be able to solve a quadratic equation by applying the quadratic formula.

Problems

1. Graph the quadratic functions below:

a) f: \mathbb{R} \mathbb{R}
 x $y = f(x) = (x + 2)^2$

b) f: \mathbb{R} \mathbb{R}
 x $y = f(x) = -3x^2$

c) f: \mathbb{R} \mathbb{R}
 x $y = f(x) = 2x^2 - 1$

d) f: \mathbb{R} \mathbb{R}
 x $y = f(x) = -(x - 3)^2 + 4$

2. Each quadratic equation can be converted into the following general form:

$$ax^2 + bx + c = 0 \quad (a \neq 0) \quad (*)$$

Determine the number of elements that the solution set of a quadratic function can have.

Hints:

- Compare the left hand side of (*) with the general form of a quadratic function.
- Think of the graph of a quadratic function.

3. Solve the quadratic equations below. State the solution set for each equation.

a) $x^2 + 10x + 24 = 0$ b) $x^2 + 22x + 121 = 0$

c) $x^2 + 2x + 8 = 0$ d) $x^2 - 3x - 10 = 0$

e) $x^2 - 14x + 49 = 0$ f) $x^2 - 8x + 25 = 0$

g) $x^2 - 7x + 10 = 0$ h) $x^2 + 6x + 5 = 0$

i) $x^2 - x - 20 = 0$

4. Solve the equations below. State the solution set for each equation.

a) $9(x - 10) - x(x - 15) = x$ b) $3(x^2 + 2) - x(x + 9) = 11$

c) $y^3 + 19 = (y + 4)^3$ d) $\frac{9x - 8}{4x + 7} = \frac{3x}{2x + 5}$

e) $\frac{x^2}{x - 6} - \frac{6x}{6 - x} = 1$

Answers

1.
 - a) vertex $V(-2|0)$, parabola opens upwards
 - b) vertex $V(0|0)$, parabola opens downwards
 - c) vertex $V(0|-1)$, parabola opens upwards
 - d) vertex $V(3|4)$, parabola opens downwards

2. ...

3.
 - a) $S = \{-6, -4\}$
 - b) $S = \{-11\}$
 - c) $S = \{ \}$
 - d) $S = \{-2, 5\}$
 - e) $S = \{7\}$
 - f) $S = \{ \}$
 - g) $S = \{2, 5\}$
 - h) $S = \{-5, -1\}$
 - i) $S = \{-4, 5\}$

4.
 - a) $S = \{5, 18\}$
 - b) $S = \{5, -1/2\}$
 - c) $S = \{-3/2, -5/2\}$
 - d) $S = \{2, -10/3\}$
 - e) $S = \{-2, -3\}$