

Quadratics

Problem Set 5

1. By considering vertical and horizontal shifts, sketch the following parabolas and give their vertex.

(a) $y = (x + 2)^2 + 1$

(e) $y = 2(x - 3)^2 - 1$

(b) $y = 3(x + 2)^2 + 1$

(f) $y = -2(x + 3)^2 - 5$

(c) $y = -3(x + 2)^2 + 1$

(g) $y = (x - 3)^2 + 4$

(d) $y = 7 - (x + 2)^2$

(h) $y = \frac{1}{2}(x + 1)^2 - 5$

2. Complete the square and sketch the parabolas.

(a) $y = x^2 + 10x + 14$

(e) $y = x^2 - 4x - 1$

(b) $y = x^2 - 8x - 1$

(f) $y = -x^2 - 14x - 46$

(c) $y = x^2 - 2x + 10$

(g) $y = 2x^2 + 12x - 1$

(d) $y = -x^2 - 2x + 7$

3. Find the maximum value of $y = 3 - (x + 7)^2$.

4. Find the minimum value of $y = x^2 - 6x + 2$.

5. Solve the following equations by factorising.

(a) $x^2 - 25 = 0$

(b) $x^2 - 8x + 16 = 0$

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

6. Solve the following equations by taking square roots.

(a) $x^2 = 25$

(c) $(x - 1)^2 - 49 = 0$

(b) $x^2 = 7$

(d) $5 - 2(x + 3)^2 = 0$

7. Solve the following equations by first completing the square.

(a) $x^2 - 2x - 6 = 0$

(b) $x^2 + 10x + 3 = 0$

8. Solve the following equations by using the quadratic formula.

(a) $x^2 + 3x - 5 = 0$

(b) $2x^2 - 4x + 1 = 0$

9. Use the discriminant to determine how many real solutions each equation has, and then solve them.

(a) $x^2 - 2x + 4 = 0$

(b) $4x^2 - 12x + 9 = 0$

(c) $x^2 + 4x - 1 = 0$

10. Consider the equation $y = x^2 - 6x + 8$.

(a) Find the x-intercepts and sketch the graph of this quadratic.

(b) Verify your sketch by writing the equation in vertex form.

(c) What are the coordinates of the vertex?

(d) What is the maximum or minimum value? For which x value does this occur?

(e) What is the y-intercept?

(f) Show all the details you have found on your graph.

11. Find the roots of the following equations and sketch their graph showing all details.

(a) $y = 3x^2 - 12x + 12$

(b) $y = -3 - 2x - x^2$

(c) $y = x^2 - 2x - 1$

12. Solve the equation for the indicated variable

(a) $V = \pi r^2 h$ for r . (Note: This is the volume of a cylinder)

(b) $F = \frac{Gm_1m_2}{r^2}$ for r . (Note: This is Newton's Law of Universal Gravitation)

(c) $A = 2x^2 + 4xh$ for x .

13. A rectangular garden is 9m by 7m. It is planned to construct a path of uniform width, x metres, around the garden. There is enough concrete so that the area taken by the path is 50 square metres. Find the width of the path.