PLOTTING QUADRATIC EQUATIONS

Answer all of these questions. Remember to show your working out in all questions.

MAIN QUESTIONS

1. $y = x^2$ | Parabola opening upwards with vertex at (0, 0)

2. $y = -x^2$ | Parabola opening downwards with vertex at (0, 0)

3. $y = x^2 + 2$ | Parabola opening upwards with vertex at (0, 2)

4. $y = x^2 - 3$ | Parabola opening upwards with vertex at (0, -3)

5. $y = (x - 1)^2$ | Parabola opening upwards with vertex at (1, 0)

6. $y = (x + 2)^2$ | Parabola opening upwards with vertex at (-2, 0)

7. $y = (x - 1)^2 + 2$ | Parabola opening upwards with vertex at (1, 2)

8. $y = (x + 3)^2 - 4$ | Parabola opening upwards with vertex at (-3, -4)

9. $y = 2x^2$ | Parabola opening upwards with vertex at (0, 0), steeper

10. $y = -3x^2$ | Parabola opening downwards with vertex at (0, 0), steeper

11. $y = 0.5x^2$ | Parabola opening upwards with vertex at (0, 0), wider

12. $y = -0.25x^2$ | Parabola opening downwards with vertex at (0, 0), wider

13. $y = 2(x - 1)^2 + 3$ | Parabola opening upwards with vertex at (1, 3), steeper

14. $y = -0.5(x + 2)^2 - 1$ | Parabola opening downwards with vertex at (-2, -1), wider

15. $y = x^2 + 4x + 4$ | Parabola opening upwards with vertex at (-2, 0)

16. $y = x^2 - 6x + 9$ | Parabola opening upwards with vertex at (3, 0)

17. $y = x^2 + 2x + 5$ | Parabola opening upwards with vertex at (-1, 4)

18. $y = x^2 - 4x + 1$ | Parabola opening upwards with vertex at (2, -3)

19. $y = -x^2 + 2x - 1$ | Parabola opening downwards with vertex at (1, 0)

20. $y = -x^2 - 4x - 4$ | Parabola opening downwards with vertex at (-2, 0)

21. $y = 2x^2 + 8x + 6$ | Parabola opening upwards with vertex at (-2, -2), steeper

22. $y = -3x^2 + 12x - 9$ | Parabola opening downwards with vertex at (2, 3), steeper

23. $y = 0.5x^2 - 2x + 2$ | Parabola opening upwards with vertex at (2, 0), wider

24. $y = -0.25x^2 + x - 1$ | Parabola opening downwards with vertex at (2, -0.5), wider

25. $y = 3x^2 - 12x + 10$ | Parabola opening upwards with vertex at (2, -2), steeper

26. $y = -2x^2 + 4x + 1$ | Parabola opening downwards with vertex at (1, 3), steeper

27. $y = x^2 + 3x + 2.25$ | Parabola opening upwards with vertex at (-1.5, 0)

28. $y = x^2 - 5x + 6.25$ | Parabola opening upwards with vertex at (2.5, 0)

29. $y = -x^2$

30. $y = -x^2$

MASTER QUESTIONS

M1. A ball is thrown upwards from a height of 2 metres with an initial velocity of 10 m/s. The height h at time t is given by $h = -5t^2 + 10t + 2$. Find the maximum height reached by the ball.

The maximum height is 7 metres

M2. The profit P in pounds from selling x items is given by $P = -2x^2 + 100x - 800$. Find the number of items that must be sold to maximise profit.

25 items must be sold to maximise profit

M3. A rectangular garden has a perimeter of 40 metres. Express the area A in terms of the length x, and find the maximum possible area.

$A = -x^2 + 20x$, maximum area is 100 m^2

M4. The path of a projectile is given by $y = -0.1x^2 + 2x$, where y is the height in metres and x is the horizontal distance in metres. Find the maximum height reached.

The maximum height is 10 metres

M5. A company's revenue R in thousands of pounds is given by $R = -0.5x^2 + 30x$, where x is the number of units sold. Find the number of units that maximise revenue.

30 units maximise revenue

M6. The area of a rectangle is given by $A = -x^2 + 14x$, where x is the length of one side. Find the dimensions that give the maximum area.

The rectangle is 7 by 7 metres

M7. A bridge's arch is modelled by $y = -0.02x^2 + 1.2x$, where y is the height in metres and x is the horizontal distance in metres. Find the maximum height of the arch.

The maximum height is 18 metres

M8. The cost C in pounds of producing x items is given by $C = x^2 - 60x + 2000$. Find the number of items that minimise the cost.

30 items minimise the cost

M9. A farmer has 200 metres of fencing to enclose a rectangular field next to a river. Express the area A in terms of the length x, and find the maximum possible area.

$A = -0.5x^2 + 100x$, maximum area is 5000 m^2

M10. The temperature T in degrees Celsius over a 24-hour period is modelled by $T = -0.5t^2 + 12t - 10$, where t is the time in hours. Find the maximum temperature reached.

The maximum temperature is 62°C