ILLAWARRA TUTORING

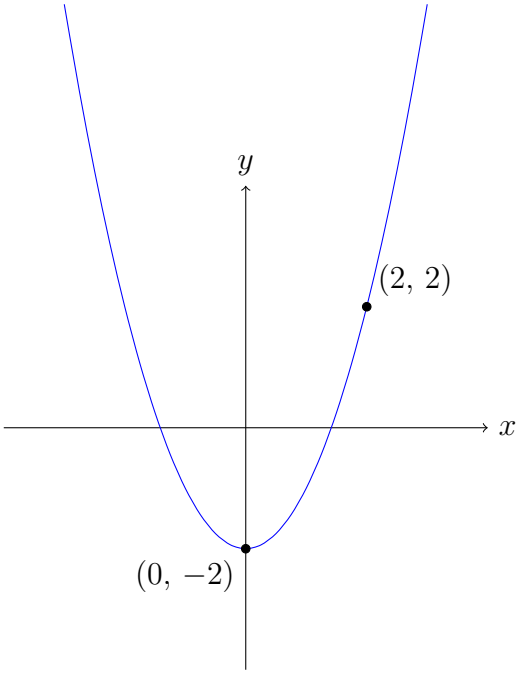
This worksheet practises determining the equation of a quadratic function based on its key characteristics. You will often be given the vertex and one other point or other key data, from which you should deduce the quadratic equation in vertex form and convert it to standard form if required.

Easy Questions

1. Find the quadratic equation with vertex $(2, -3)$ that passes through the point $(4, 1)$. Use the form $y = a(x-2)^2 - 3$ and determine a.
2. Determine the quadratic equation with vertex $(0, 0)$ that passes through $(1, 1)$. Express your answer in vertex form.
3. Find the quadratic equation with vertex $(-1, 2)$ that passes through the point $(1, 6)$. Write your answer in vertex form.
4. Find the quadratic equation with vertex $(3, 5)$ and y-intercept $(0, 17)$. Express the equation in vertex form.
5. A parabola has vertex $(-2, 1)$ and passes through $(0, 5)$. Find its quadratic equation in vertex form.

Intermediate Questions

6. Find the quadratic equation with vertex $(1, -2)$ and passing through $(3, 6)$. Then expand your answer into standard form.
7. The parabola has an axis of symmetry $x = 2$ and passes through the points $(0, 3)$ and $(4, 3)$. Determine its equation.
8. The quadratic function has vertex $(-3, -4)$ and one x-intercept at $(1, 0)$. Find its equation in vertex form.
9. A downward-opening parabola has maximum at $(3, 7)$ and passes through $(5, 3)$. Determine its equation.
10. Find the quadratic equation with vertex $(-1, -2)$ and y-intercept $(0, 0)$.
11. Determine the quadratic equation with vertex $(2, 3)$ that passes through $(4, 11)$. Write your answer in standard form.
12. Consider the parabola shown below. Its vertex is at $(0, -2)$ and it passes through $(2, 2)$. Find its equation.



13. Find the quadratic equation with vertex $(-2, 4)$ that passes through $(0, 0)$, and then express your answer in factorised form.

14. Determine the quadratic function with vertex $(1, 4)$ and passing through $(-1, 0)$. Write your answer in vertex form.

15. Find the quadratic equation with vertex $(-3, -2)$ that also passes through $(0, 1)$.

16. A parabola has axis of symmetry $x = 2$ and passes through $(0, 5)$ and $(4, 5)$. Determine its quadratic equation.

17. A parabola that opens downward has its turning point at $(2, 8)$ and passes through $(4, 0)$. Find its quadratic equation.

18. Determine the quadratic equation with vertex $(0, -3)$ that passes through $(2, 5)$.

19. Find the quadratic function with vertex $(3, 6)$ and passing through $(5, 10)$.

20. A parabola has vertex $(-1, -4)$ and passes through $(2, 11)$. Determine its equation in vertex form.

Hard Questions

21. Given that a quadratic function has vertex $(2, -1)$ and passes through $(-1, 8)$, find its equation in vertex form and then expand it to standard form.

22. A parabola has vertex $(-2, 3)$ and a point symmetric to the vertex at $(0, 7)$. Determine its quadratic equation in vertex form and then factorise it.

23. The parabola with vertex $(4, -5)$ passes through $(2, 3)$. Find its quadratic equation and determine its x-intercepts.

24. The quadratic function is given by $y = a(x-1)^2 + q$. It is known that its vertex is on the line $x = 1$, it has y-intercept $(0, 7)$, and passes through $(3, -1)$. Determine a and q, and hence write its equation.

25. Find the quadratic function with vertex $(0, 2)$ that passes through $(4, 18)$. Express your answer in factorised form.

26. A parabola opening upwards has vertex $(-3, 2)$ and its graph touches the x-axis. Determine its quadratic equation.

27. A quadratic function is given in vertex form by $y = a(x+2)^2 - 3$. If it passes through $(-1, 1)$, determine a and write the equation in standard form.

28. The quadratic function $y = a(x+5)^2 + b$ has its vertex at $(-5, b)$. Given that the function passes through $(0, 20)$ and $(-10, 20)$, determine a and b, and verify that these points are symmetric about the vertex.

29. The height of a thrown ball is modelled by a quadratic function $h(t)$ of time t. If the ball reaches its maximum height of 25 metres at $t = 2$ s and is at a height of 13 metres at $t = 3$ s, determine the quadratic function that describes the height in terms of time.

30. A quadratic function has vertex $(1, -2)$ and passes through $(4, 10)$. Determine its equation in vertex form and then expand it to provide the standard form.