

Solutions

6.1 Choosing a Solving Method

6.1.1. Solve $x^2 + 2x - 8 = 0$.

Solution. Factor: $(x + 4)(x - 2) = 0$, giving $x = -4$ or $x = 2$.

6.1.2. Solve $2x^2 - 8 = 0$.

Solution. $x^2 = 4$, so $x = \pm 2$.

6.1.3. Solve $x^2 - 2x - 1 = 0$ exactly.

Solution. Using the quadratic formula gives $x = (2 \pm \sqrt{8})/2 = 1 \pm \sqrt{2}$.

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6.2 The Vertex and Parabola Features

6.2.1. Find the vertex and axis of $y = -(x + 1)^2 + 5$.

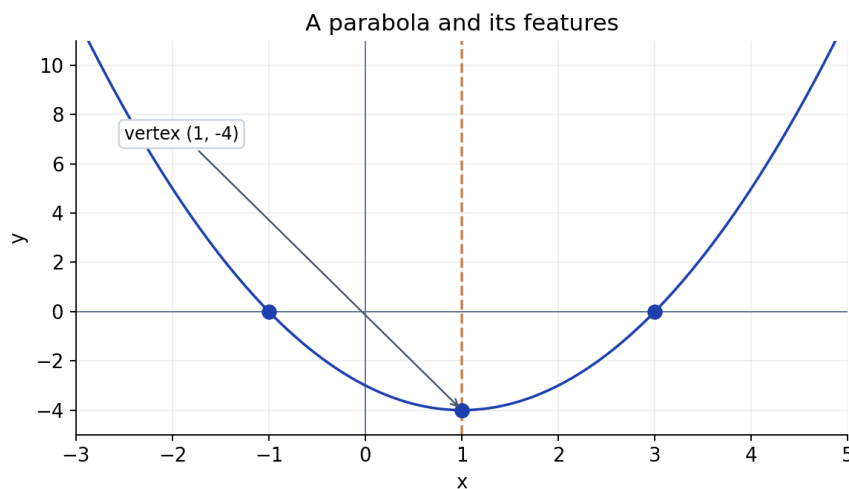
Solution. The vertex is $(-1, 5)$ and the axis is $x = -1$. It opens downward, so the maximum is 5.

6.2.2. Find the minimum of $y = x^2 + 6x + 11$.

Solution. Complete the square: $y = (x + 3)^2 + 2$. The minimum is 2 at $x = -3$.

6.2.3. Read the vertex, axis, and zeros of the graphed parabola $y = (x - 1)^2 - 4$.

Solution. The vertex is $(1, -4)$ and the axis is $x = 1$. Setting $y = 0$ gives $(x - 1)^2 = 4$, so the zeros are $x = -1$ and $x = 3$.



Vertex $(1, -4)$; axis $x = 1$; zeros -1 and 3 .

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6.3 The Discriminant

6.3.1. How many real roots does $x^2 - 3x - 1 = 0$ have?

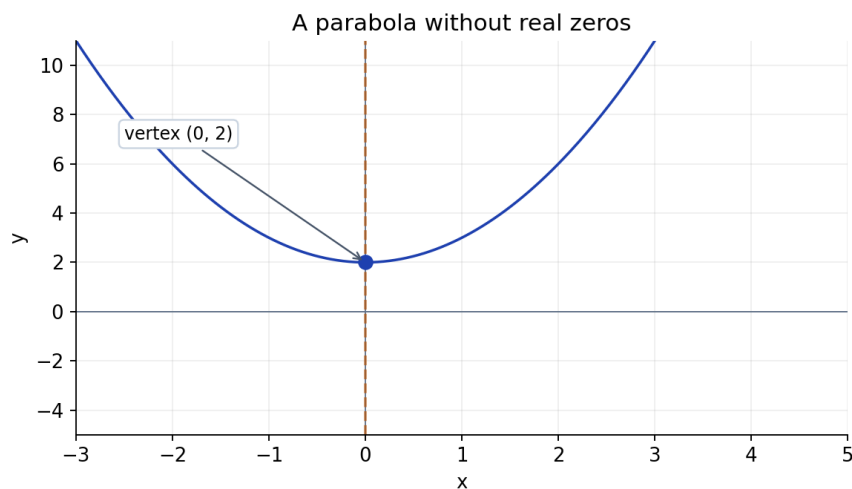
Solution. $D = 9 + 4 = 13 > 0$, so there are two distinct real roots.

6.3.2. Find k so that $x^2 + 6x + k = 0$ has a repeated root.

Solution. A repeated root requires $D = 36 - 4k = 0$. Thus $k = 9$.

6.3.3. Use the graph of $y = x^2 + 2$ to check the discriminant prediction for its zeros.

Solution. Here $D = 0^2 - 4(1)(2) = -8 < 0$. The graph stays above the x-axis, so there are no real zeros.



The discriminant is -8 and there are no real zeros.