Let $f(x) = 2x^2 + kx + 1$ and $g(x) = -x - 1$.

The graphs of f and g intersect at two distinct points.

Find the possible values of k

In order to find the points of intersection of the two functions, we solve

$$f(x) = g(x)$$

$$2x^2 + kx + 1 = -x - 1$$

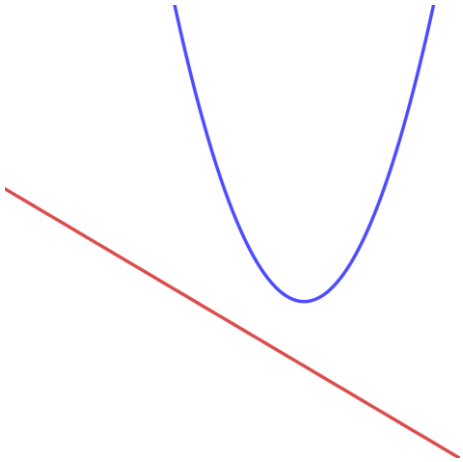
$$2x^2 + kx + x + 2 = 0$$

$$2x^2 + (k+1)x + 2 = 0$$

Depending on the value of the parameter k, f and g could meet

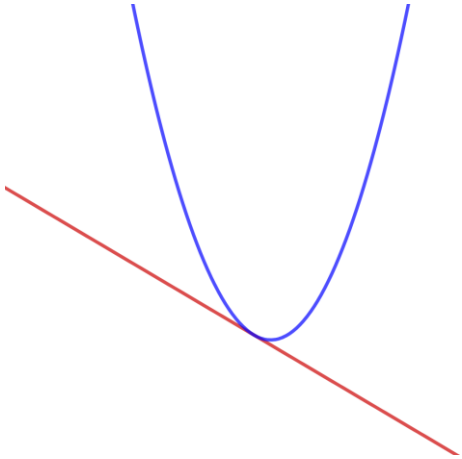
…at zero points

The discriminant of the quadratic equation, $\Delta < 0$

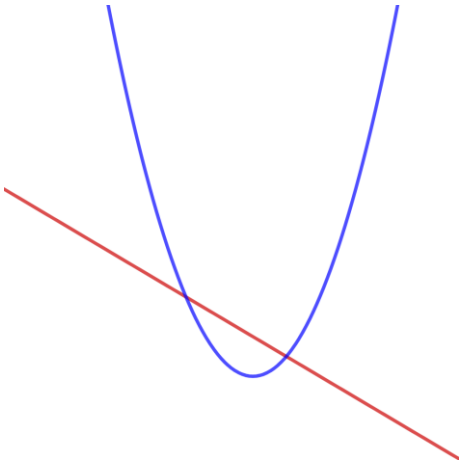


…at one repeated point

The discriminant of the quadratic equation, $\Delta = 0$



… at two distinct points



The discriminant of the quadratic equation, $\Delta > 0$

This is the case we are asked to solve!

$$2x^2 + (k+1)x + 2 = 0$$

$\Delta = b^2 - 4ac$

$$\Delta = (k+1)^2 - 4 \cdot 2 \cdot 2$$

$$\Delta = k^2 + 2k + 1 - 16$$

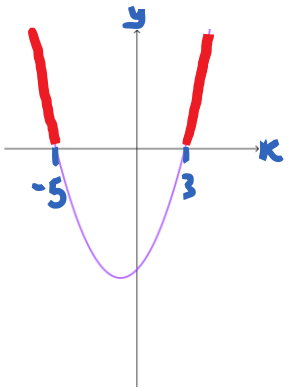
$$\Delta = k^2 + 2k - 15$$

The discriminant of the quadratic equation, $\Delta > 0$

$$k^2 + 2k - 15 > 0$$

Sketch the graph of $y = k^2 + 2k - 15$

$y = (k-3)(k+5)$



$$k^2 + 2k - 15 > 0$$

$$k < -5 \, , k > 3$$

$f(x) = 2x^2 + kx + 1$

$g(x) = -x - 1$

The graphs of f and g intersect at two distinct points when

$\boldsymbol{k < -5 \, , k > 3}$