Let $f(x) = x^2 + 2px + (3p + 4)$

Find the value of p so that $f(x) = 0$ has two **equal** roots.

For the general quadratic equation $ax^2 + bx + c = 0$

the discriminant $\Delta = b^2 - 4ac$

$x^2 + 2px + (3p + 4) = 0$

$\Delta = (2p)^2 - 4 \cdot 1(3p + 4)$

equation has equal roots when $\Delta = 0$

$4p^2 - 12p - 16 = 0$

We can divide the equation through by 4

$p^2 - 3p - 4 = 0$

…and solve

$(p - 4)(p + 1) = 0$

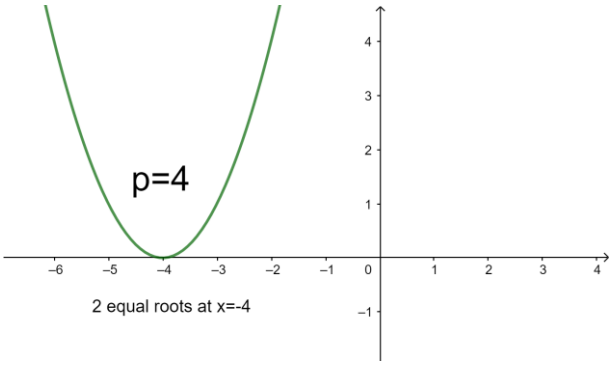
$\boldsymbol{p = 4, p = -1}$

We can see that this is true if we plot the graph of $f(x)$ $f(x) = x^2 + 2px + (3p + 4)$

$\boldsymbol{p = 4}$ $f(x) = x^2 + 2 \cdot 4x + (3 \cdot 4 + 4)$

$f(x) = x^2 + 8x + 16$

$f(x) = (x + 4)^2$



$\boldsymbol{p = -1}$ $f(x) = x^2 + 2(-1)x + 3(-1) + 4$

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

$f(x) = (x - 1)^2$