

The discriminant: equal roots

A LEVEL LINKS

Scheme of work: 1b. Quadratic functions – factorising, solving, graphs and the discriminants

Key points

- A quadratic equation is an equation in the form $ax^2 + bx + c = 0$ where $a \neq 0$.
- For the quadratic function $f(x) = a(x + p)^2 + q$, the graph of $y = f(x)$ has a turning point at $(-p, q)$
- For the quadratic equation $ax^2 + bx + c = 0$, the expression $b^2 - 4ac$ is called the discriminant. The value of the discriminant shows how many roots $f(x)$ has:
 - If $b^2 - 4ac > 0$ then the quadratic function has two distinct real roots.
 - If $b^2 - 4ac = 0$ then the quadratic function has one repeated real root.
 - If $b^2 - 4ac < 0$ then the quadratic function has no real roots.

Practice questions

1 The equation $x^2 + 3pq + p = 0$, where p is a non-zero constant, has equal roots.

Find the value of p .

2 The equation $x^2 + 2px + (3p + 4) = 0$, where p is a positive constant, has equal roots.

(a) Find the value of p .

(b) For this value of p , solve the equation $x^2 + 2px + (3p + 4) = 0$.

3 Given that the equation $kx^2 + 12x + k = 0$, where k is a positive constant, has equal roots, find the value of k .

Answers

1 $p = \frac{4}{9}$

2 (a) $p = 4$

 (b) $x = -4$

3 $k = 6$