

The Discriminant [Ch. 4]

- 1 (i) Calculate the discriminant of $3x^2 - 4x + 2$. [2]
(ii) Hence state the number of real roots of the equation $3x^2 - 4x + 2 = 0$. [1]
- 2 (i) Calculate the discriminant of the quadratic polynomial $-x^2 + 4x - 7$. [2]
(ii) State the number of real roots of the equation $-x^2 + 4x - 7 = 0$ and hence explain why $-x^2 + 4x - 7 < 0$ for all values of x . [3]
- 3 (a) (i) Calculate the discriminant of the quadratic polynomial $2x^2 + 6x + 7$. [2]
(ii) State the number of real roots of the equation $2x^2 + 6x + 7 = 0$, and hence explain why $2x^2 + 6x + 7$ is always positive. [3]
(b) The quadratic equation
$$kx^2 + (4k + 1)x + (3k + 1) = 0$$
has a repeated root. Find the value of the constant k . [4]
- 4 (i) Calculate the discriminant of $3x^2 + 5x + 8$. [2]
(ii) Write down the number of points of intersection of the curve $y = 3x^2 + 5x + 8$ with the x -axis. [1]
(iii) Show that $y = 11x + 5$ is a tangent to the curve $y = 3x^2 + 5x + 8$. [5]
- 5 The equation $x^2 + 4kx + 3k = 0$, where k is a constant, has distinct real roots.
(i) Prove that $k(4k - 3) > 0$. [3]
(ii) Hence find the set of possible values of k . [4]
It is given instead that the x -axis is a tangent to the graph of $y = x^2 + 4kx + 3k$.
(iii) Write down the possible values of k . [2]
- 6 (i) Find the coordinates of the points where the curve $y = 4x^2 - 8x - 5$ crosses the axes. [4]
(ii) Hence sketch the curve. [1]
(iii) The equation $4x^2 - 8x - 5 = k$ has one real solution. Find the constant k . [3]