

The Discriminant

1. State the nature of the roots of each of the following
 - (a) $x^2 + 3x - 7 = 0$
 - (b) $3x^2 = 5x - 2$
 - (c) $5x^2 - x = -11$
2. Show that the roots of the equation $x^2 + px - 1 = 0$ are always real.
3. Show that the roots of the equation $mx^2 + m = 2mx$ are equal.
4. For what value of k does the equation $2x^2 - 7x + k + 5 = 0$ have equal roots?
5. The roots of the equation $(x + 2)(2x - n) = -2$ are equal. Find the values of n.
6. Show that the roots of $(p - 2)x^2 - (3p - 2)x + 2p = 0$ are always real.
7. Show that $x(x + 12) + 9 = 2(x - 8)$ has equal roots and find the corresponding value of x.
8. Show that the roots of $2x(x - 1) + 1 = 6x - 7$ are equal and find x.
9. Show that the line $y = 2x - 21$ is a tangent to the parabola $y = x^2 - 10x + 15$ and find the point of contact.
10. Show that the line $y = 10x - 2$ is a tangent to the curve $y = 2x(x + 3)$ and find the point of contact.
11. Is the line $y = 4x - 1$ a tangent to the curve $y = 3x^2 - 11x + 5$?
12. Show that there are two values of m for which $(x - m)^2 = 3x(2 - x)$ has equal roots.
13. The roots of the equation $\frac{p-1}{x} + \frac{x}{4} = 1$ are equal. Find p.
14. (a) If $\frac{(x-2)^2}{x^2+2} = k$, show that $(k-1)x^2 + 4x + (2k-4) = 0$.

(b) Find the range of values of k such that the equation $\frac{(x-2)^2}{x^2+2} = k$ has real roots.