Discriminant and number of real roots

6 questions | 16 marks

Equivalent correct methods earn the corresponding marks.

1. Find the discriminant of $x^2 - 8x + 7 = 0$ and state the number of real roots. [2 marks]

$(-8)^2 - 4(1)(7) = 64 - 28 = 36.$

Answer: $\Delta = 36$; two distinct real roots.

2. Classify the real roots of $2x^2 - 4x + 2 = 0$. [2 marks]

$\Delta = 16 - 16 = 0.$

Answer: One repeated real root.

3. Classify the real roots of $2x^2 + x + 3 = 0$. [2 marks]

$\Delta = 1 - 24 = -23.$

Answer: No real roots.

4. Find c if $x^2 - 4x + c = 0$ has one repeated real root. [3 marks]

$16 - 4c = 0$, hence $c = 4$.

Answer: $c = 4$

5. For which real values of k does $x^2 + kx + 9 = 0$ have two distinct real roots? [3 marks]

$\Delta = k^2 - 36 > 0.$

This requires $|k| > 6$.

Answer: $k < -6$ or $k > 6$

6. A graph has equation $y = x^2 - 6x + k$. Describe its x-axis intersections when k is less than, equal to, or greater than 9. [4 marks]

The discriminant is $36 - 4k$.

Its sign changes at $k = 9$.

Answer: $k < 9$: two crossings; $k = 9$: tangent at $(3, 0)$; $k > 9$: no intersection.