MEMORANDUM

Name: ..... Class: .....

Date: .....

MARK ____ / 22

Answer all questions. Show all your working — marks are awarded for method as well as the final answer. **Teacher copy: accept any correct equivalent method.**

1 Δ for $x^2 - 6x + 9 = 0$, and the nature of roots. *(classify)* (2)

$36 - 36 = 0 \rightarrow$ **one real (equal) root** ✓✓ (2)

2 Δ for $x^2 + 2x + 5 = 0$, and the nature of roots. *(classify)* (2)

$4 - 20 = -16 < 0 \rightarrow$ **no real roots** ✓✓ (2)

3 Δ for $2x^2 - 7x + 3 = 0$, and the nature. *(classify)* (2)

$49 - 24 = 25 > 0$, and 25 is a perfect square → the roots are **real, rational and unequal** ✓✓ (2)

4 Are the roots of $x^2 - 4x + 4 = 0$ rational? *(rational?)* (2)

$\Delta = 0$ (perfect square) → **rational (equal)** ✓✓ (2)

5 Rational or irrational: $x^2 - 2x - 2 = 0$? *(rational?)* (2)

$\Delta = 4 + 8 = 12$, not a perfect square → **irrational** ✓✓ (2)

6 For which k does $x^2 + kx + 4 = 0$ have equal roots? *(equal, find k)* (3)

$k^2 - 16 = 0 \rightarrow k = \pm 4$ ✓✓✓ (3)

7 For which k does $x^2 - 6x + k = 0$ have equal roots? *(equal, find k)* (2)

$36 - 4k = 0 \rightarrow k = 9$ ✓✓ (2)

8 For which k does $x^2 + 2x + k = 0$ have two real roots? *(real, find k)* (3)

$4 - 4k > 0 \rightarrow k < 1$ ✓✓✓ (3)

9 For which k does $x^2 - 2x + k = 0$ have no real roots? *(non-real, find k)* (3)

$4 - 4k < 0 \rightarrow k > 1$ ✓✓✓ (3)

10 Δ for $3x^2 - 5x + 1 = 0$. *(compute)* **(1)**

$25 - 12 = \mathbf{13}$ (two real, irrational) ✓ **(1)**

TOTAL: 22 marks

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