HIGHER MATHS
POLYNOMIALS & QUADRATICS

Use this checklist with the Clelland Maths videos to master synthetic division, discriminants, and graphs for SQA assessments.

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1 POLYNOMIAL SKILLS

☐ **Synthetic Division**
Set up the table correctly (including 0 for missing terms) and calculate the remainder

☐ **The Factor Theorem**
Show that $f(h) = 0 \implies (x - h)$ is a factor (Formal statement required)

☐ **Finding Unknown Coefficients**
Use simultaneous equations to find a and b given two pieces of info (e.g. factor and remainder)

☐ **Solving Polynomial Equations**
Factorise fully then solve $f(x) = 0$ to find roots (e.g. $x = -2, 1, 3$)

2 QUADRATIC THEORY

☐ **Completing the Square**
Express functions in the form $a(x + b)^2 + c$ (including non-unitary coeff of x^2)

☐ **The Discriminant Formula**
State and apply $b^2 - 4ac$ to determine the nature of roots

☐ **Nature of Roots Conditions**
Know conditions for: Two distinct roots (> 0), Equal roots ($= 0$), No real roots (< 0)

☐ **Finding Unknowns with Discriminant**
Find range of values for k or p that satisfy a specific root condition

③ GRAPHS & APPLICATIONS

☐ **QUADRATIC INEQUALITIES**
Solve $ax^2 + bx + c > 0$ by sketching the parabola to find valid intervals

☐ **INTERSECTION OF CURVES**
Equate $y = y$, set to 0, then solve for x to find points of intersection

☐ **PROVING TANGENCY**
Show that the discriminant $b^2 - 4ac = 0$ to prove a line is a tangent

④ COMMON EXAM QUESTIONS

☐ **"Show that..." (Factor)**
Must write: "Since remainder is 0, $(x - h)$ is a factor."

☐ **"Hence..." (Solve/Factorise)**
Use the quadratic quotient from your synthetic division table; do not restart.

☐ **Equation from Graph**
Use roots to form $y = k(x - a)(x - b)\ldots$, then sub in a point to find k.

🎓 SQA EXAM TIPS

- **Communication:** You lose the mark if you don't explicitly state the condition for the discriminant (e.g., "For equal roots, $b^2 - 4ac = 0$").

- **Strictly Increasing:** If asked to show a function is strictly increasing, show the derivative is a quadratic with $b^2 - 4ac < 0$ and positive x^2 coeff.

- **Inequalities:** Never just guess the range for x. Always sketch the mini-quadratic to see if you need the "inside" or "outside" region.