

M2H Lesson 14 – Quadratic Formula & Discriminant

(A) Skills Review/Consolidation

- Determine the EXACT zeroes of (a) $f(x) = 4x^2 + 3x - 8$ (b) $f(x) = x^2 + 10x - 5$
- Provide an APPROXIMATE solution (3 SF) to (a) $-2x^2 + 2 = -4x$ (b) Find the roots of $f(x) = 1 - 3x - x^2$
- Find the value of the discriminant in the following quadratic functions:
 - $f(x) = 3x - x^2 - 3$
 - $f(x) = x^2 + 4\sqrt{2}x = 8$
 - $f(x) = -2x^2 + 3x + 1$
 - $f(x) = 4x^2 - 12x + 5$
- Show that $x^2 - 3x + 6 > 0$ for all x .

(B) Skill Extension

- From your answers in Q1ab&2ab, rewrite the quadratic function in root form & vertex form.
- Find the minimum value b in the QF $y = x^2 - bx + 4$ such that the quadratic has at least one real root.
- Find the maximum value of c in the QF $y = c + 5x - x^2$ such that the quadratic has 2 real roots
- If $y = -4kx^2 + kx - 1$, determine the value(s) of k for which the parabola has 2 real roots. Explain your reasoning
- Determine the value of W such that $f(x) = Wx^2 + 2x - 5$ has one real root. Verify your solution (i) graphically and (ii) using an alternative algebraic method.
- Determine the value of b such that $f(x) = 2x^2 + bx - 8$ has no solutions. Explain the significance of your results.
- Determine the value of c such that $f(x) = x^2 + 4x + c$ has 2 distinct real roots.
- Determine the value of c such that $f(x) = x^2 + 4x + c$ has 2 distinct real rational roots.
- The parabola $y = ax^2 + bx + 1$ passes through the point (1,2). For what values of a does the parabola intersect the x -axis at two distinct points?
- Solve the system $\begin{cases} y = x^2 + 4x + 6 \\ y = mx + 5 \end{cases}$ for m such that there exists only one unique solution. The line(s) $y = mx + 5$ are called tangent lines.
- Write an equation with rational coefficients having $2 - 4\sqrt{3}$ as one of its roots.

(C) Graphing Connection – Quadratic Formula & the Discriminant.

- From the value of discrim. in $f(x) = 3x - x^2 - 3$ from Q3a → what is the graphical significance of your answer?
- From the value of discrim. in $f(x) = x^2 + 4\sqrt{2}x = 8$ from Q3b → what is the graphical significance of your answer?
- From the value of discrim. in $f(x) = -2x^2 + 3x + 1$ from Q3c → what is the graphical significance of your answer?
- From the value of discrim. in $f(x) = 4x^2 - 12x + 5$ from Q3d → what is the graphical significance of your answer?

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20. Can 2 different quadratic functions have the same roots, but have different axes of symmetry?
21. Given the quadratic functions (a) $f(x) = 3x^2 - 10x + 5$ (b) $f(x) = -2x^2 + 6x - 3$, determine the: (a) domain and range, (b) vertex & the max/min point & value, (c) the y-intercepts of $f(x)$ and (d) Sketch

(D) Applications

22. Student council plans to hold a talent show to raise money for charity. Last year, they sold tickets for \$11 each and 400 people attended. Student council decides to raise ticket prices for this year's talent show. The council has determined that for every \$1 increase in price, the attendance would decrease by 20 people. What ticket price will maximize the revenue from the talent show?
23. A rectangular box has a square base and its height is 1 cm longer than the length of one side of its base. If x is the length of one side of its base, (i) show that the equation for its total surface area is given by $A(x) = 6x^2 + 4x$ and then (ii) find the dimensions of the box such that the total surface area is 240 cm^2 .
24. An open box contains 80 cm^3 and is made from a square piece of metal with 3 cm squares cut from each of the four corners. Find the dimension of the original metal sheet from which the open box was made.

