Quadratics and polynomial graphs - Practice 3

Name: _____ Date: _____

10 questions | 49 marks | 65 minutes

Tables, parameter conditions, reciprocal roots and modelling from measured data.

A scientific calculator may be used.

1. The table gives values of one quadratic function. [5 marks]

Values of y at selected x-values

x	-1	0	1	2	3
y	0	-6	-8	-6	0

(a) Use the symmetry to state the turning point and roots. [2 marks]

(b) Find a rule for the function. [3 marks]

2. Solve the two equations. [4 marks]

(a) $6x^2 - x - 2 = 0$. [2 marks]

(b) $x^2 - 3 = 2x$. [2 marks]

3. For $f(x) = 2x^2 + 12x + k$: [5 marks]

(a) Write f in vertex form. [2 marks]

(b) Find k if the minimum is 5, then explain why there are no real roots. [3 marks]

4. The nonzero roots of $x^2 - 5x + 2 = 0$ are r and s. [5 marks]

(a) Find $\frac{1}{r} + \frac{1}{s}$ and $\frac{1}{rs}$. [3 marks]

(b) Form a quadratic with roots $\frac{1}{r}$ and $\frac{1}{s}$ and integer coefficients. [2 marks]

5. Consider $kx^2 - 4x + 1 = 0$. [4 marks]

(a) For nonzero k, find the condition for two distinct real roots. [3 marks]

(b) Solve separately when $k = 0$. [1 mark]

6. A family of horizontal lines $y = k$ meets $y = (x+1)^2 + 2$. [4 marks]

(a) Give the number of intersections for $k < 2$, $k = 2$ and $k > 2$. [2 marks]

(b) Find the intersection coordinates when $k = 11$. [2 marks]

7. A monic cubic $p(x) = x^3 + ax^2 + bx + 6$ has roots 1 and -2. [6 marks]

(a) Form and solve simultaneous equations for a and b. [4 marks]

(b) Find the third root. [2 marks]

8. Let $g(x) = x^4 - 2x^2 - 3$. [5 marks]

(a) Find every real root exactly. [3 marks]

(b) Explain why the equation has fewer than four real roots. [2 marks]

9. An arch meets the ground at $x = 0$ m and $x = 10$ m. Its height at $x = 2$ m is 8 m. [5 marks]

(a) Find a quadratic rule and state the physical domain. [3 marks]

(b) Find its maximum height and position. [2 marks]

10. A small event estimates attendance as $N = 120 - 4p$, where p is the ticket price in dollars and $0 < p < 30$. Revenue is pN dollars. [6 marks]

(a) Find the price giving greatest revenue and the predicted attendance. [3 marks]

(b) Find both ticket prices predicted to produce 800 dollars revenue. [3 marks]