Sketching the Parabola $y = ax^2 + q$ (Grade 10)

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 Write down the shape and the turning point of $y = 3x^2 - 5$. (2)

$a = 3 > 0$, so it opens UP ✓; turning point **(0 ; −5)** ✓ (2)

2 Write down the y-intercept and the range of $y = x^2 + 2$. (2)

(0 ; 2) ✓; **$y \geq 2$** ✓ (2)

3 Determine the x-intercepts of $y = x^2 - 9$. (2)

$x^2 = 9$ ✓, so **$x = -3$ or $x = 3$** ✓ (2)

4 Determine the x-intercepts of $y = 2x^2 - 8$. (3)

$2x^2 = 8$ ✓; $x^2 = 4$ ✓; **$x = \pm 2$** ✓ (3)

5 Does $y = x^2 + 5$ cut the x-axis? Give a reason. (2)

No ✓ — $x^2 = -5$ has no real solution ✓ (2)

6 Write down the range of $y = -x^2 + 4$. (2)

$a < 0$, so $(0 ; 4)$ is a maximum ✓; **$y \leq 4$** ✓ (2)

7 $y = ax^2 + q$ has turning point $(0 ; 1)$ and passes through $(2 ; 9)$. Determine a and q. (3)

$q = 1$ ✓; $9 = 4a + 1$ ✓; **$a = 2$** ✓ (3)

8 Describe how $y = x^2 - 3$ differs from $y = x^2$. (2)

The same shape ✓, moved 3 units **down** ✓ (2)

9 Describe how $y = -x^2$ differs from $y = x^2$. (2)

It is reflected in the x-axis ✓, so it opens **downwards** ✓ (2)

10 Write down the domain and the range of $y = 2x^2 - 6$. **(2)**

Domain $x \in \mathbb{R}$ ✓; range $y \geq -6$ ✓ **(2)**

TOTAL: 22 marks

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