Mrs Israel
Mrs Kerr
Ms Lau
Mrs Millar
Mrs Squires

Name: ……..……..

Teacher:…….

Pymble Ladies' College

HSC ASSESSMENT TASK 1
Term 4
2017

Time Allowed: 1 hour

Mathematics Extension 1

General Instructions

- Use Multiple Choice Answer Sheet for Questions 1-4.
- Use pencil to complete the Multiple Choice Answer Sheet.
- Write using black or blue pen for Section II.
- Start each question in a **new** booklet.
- Approved calculators may be used.
- For all Questions in Section II, show relevant mathematical reasoning and/or calculations.
- Diagrams are not necessarily drawn to scale.
- Marks may be deducted for careless or untidy work.

Mark	**/35**
Rank	**/**
Highest Mark	**/35**

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Section I (4 Marks)

Attempt all Questions

Use the Multiple Choice Answer Sheet

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1 Given that a quadratic function with integer coefficients has a positive non-square discriminant, which of the following statements about its zeroes is true?

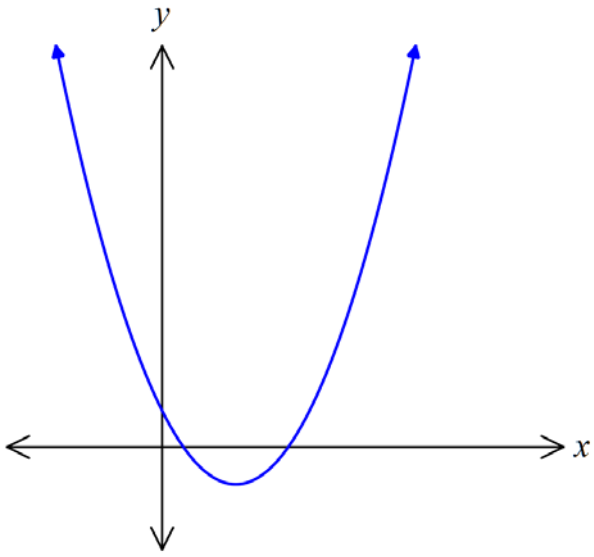
(A) Equal zeroes

(B) Distinct irrational zeroes

(C) Distinct rational zeroes

(D) No real zeroes

2



Which of the following sets of statements is true for the quadratic $y = ax^2 + bx + c$ graphed above?

(A) $a > 0,\ c = 0,\ \Delta > 0.$

(B) $a \neq 0,\ c > 0,\ \Delta < 0.$

(C) $a < 0,\ c > 0,\ \Delta = 0.$

(D) $a > 0,\ c > 0,\ \Delta > 0.$

3 Consider the parametric equations $x = t + 2$ and $y = 4t^2$. Which of the following is the Cartesian equation?

(A) $y = 4(x + 2)^2$

(B) $y = 4(x - 2)^2$

(C) $y = 4\sqrt{x + 2}$

(D) $y = 4\sqrt{x - 2}$

4 The quadratic equation $2x^2 - 18x + c = 0$ has one root twice the other.
What is the value of c?

(A) 3

(B) 9

(C) 18

(D) 36

Section II

Attempt all Questions (31 marks)

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available

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Question 5 (9 marks) **Marks**

(a) Use the substitution $u = x - 3$ to evaluate $\int_3^4 x\sqrt{x-3}\ dx$. **3**

(b) The equation $x^2 - 4x + 6 = 0$ has roots *m* and *n*. Find a quadratic equation with integer coefficients which has roots $\frac{1}{m}$ and $\frac{1}{n}$. **3**

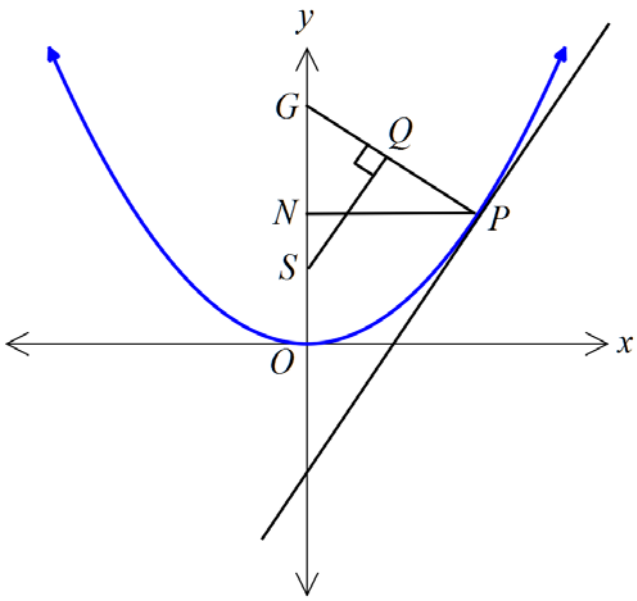
(c) Solve $\left(x + \frac{1}{x}\right)^2 + 6 = 5\left(x + \frac{1}{x}\right)$ for *x*. **3**

Question 6 (11 marks) Use a SEPARATE writing booklet. **Marks**

(a) A and B are the points $(-2,-2)$ and $\left(\frac{1}{2},-\frac{1}{8}\right)$ respectively. **3**

Show that AB is a focal chord of $x^2 = -2y$.

(b) Consider the variable point $P\left(2at, at^2\right)$ on the parabola $x^2 = 4ay$.



(i) The line from S, the focus of the parabola, meets the normal at P at right angles at Q, as shown. **2**

Show that Q has coordinates $\left(at, a\left(t^2+1\right)\right)$.

(ii) Show that the locus of Q is a parabola and state its focal length. **3**

(iii) The line from P, parallel to the x-axis, meets the y-axis at N. **3**

By finding the perpendicular distance of the focus to the normal, or otherwise, show that $SQ^2 = ON \times SP$.

Question 7 (11 marks) Use a SEPARATE writing booklet. **Marks**

(a) The equation of the chord of contact from $P(x_0, y_0)$ is $xx_0 = 2a(y + y_0)$. **2**
[DO NOT PROVE THIS]

Find the coordinates of the point which gives $x - 3y - 15 = 0$ as the chord of contact to the parabola $x^2 = 12y$.

(b) $P(2at, at^2)$ is a variable point on the parabola $x^2 = 4ay$, whose focus is *S*.
$Q(x, y)$ divides the interval from *P* to *S* in the ratio $t^2 : 1$.

(i) Find the coordinates of *Q* in terms of *a* and *t*. **2**

(ii) Verify that $\frac{y}{x} = t$. **1**

(iii) Prove that, as *P* moves on the parabola, *Q* moves on a circle, and state its centre and radius. **3**

(c) By using the substitution $u = x^2 + 4$, find $\int x^3 (x^2 + 4)^4 \, dx$. **3**

End of Task