

Name and Surname :

Grade/Class : 11/..... **Mathematics Teacher** :

Hudson Park High School



GRADE 11
MATHEMATICS
June Paper 1

Time : 2 hours

Date : June 2015

Marks : 100

Examiner : SLT

Moderator(s) : SLK and CLM

INSTRUCTIONS

1. Illegible work, in the opinion of the marker, will earn zero marks.
 2. Number your answers clearly and accurately, exactly as they appear on the question paper.
 3. **NB** Start each question at the top of a new page and leave 2 lines open between each answer.
 4. Employ relevant formulae and show all working out. Answers alone may not be awarded full marks.
 5. (Non programmable and non graphical) Calculators may be used, unless their usage is specifically prohibited.
 6. Round off answers to 2 decimal places, where necessary, unless instructed otherwise.
 7. **ORGANISATION**
 - 7.1. Fill in the expected details on the front of this Question Paper.
 - 7.2. An Answer Sheet is provided for Question 6, detach it and fill in the expected details.
 - 7.3. At the end of the Examination, hand in your Question Paper and Answer Pages separately.
 - 7.4. Your answer pages should be stapled in the following manner :
 - Foolscap answer pages in order (on top), and
 - Answer Sheet for Question 6 (below).
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QUESTION 1 [40 marks]

1.1. Solve for x :

1.1.1 $x(3x - 4) = 5$ 4

1.1.2 $(x - 3)(2 - x) < 0$ 3

1.1.3 $\frac{5^x \cdot \sqrt{x}}{x - 7} \geq 0$ 2

1.1.4 $\left(x^{\frac{3}{4}} + 4\right)\left(3x^{-\frac{7}{3}} + 5\right) = 0$ 4

1.1.5 $32 \left(\frac{2}{3}\right)^{3x-1} = 243$ without the use of a calculator 5

1.1.6 $4\pi x^{-2} - 5 = 0$ 4 (22)

1.2. Solve for x and y :

$$x^2 - 2yx + 2x = y^2 \quad \text{and} \quad 4^x = 2 \cdot 2^y \quad (7)$$

1.3. Solve for $\frac{x}{y}$, if $x \neq 0$ and $y \neq 0$: $\frac{x}{y} + \frac{y}{x} = \frac{25}{12}$ (4)

1.4. Given : $\sqrt{7-x} = x + 5$

1.4.1. Without solving the equation, determine the values of a and b , if $a \leq x \leq b$. 2

1.4.2. Solve the given equation for x . 5 (7)

QUESTION 2 [11 marks]

2.1. Given : $\frac{m(x^2 + x - 1)}{3 - x} = x \quad (x \neq 3)$

2.1.1. Determine the discriminant of the given equation, showing that it will be :

$$\Delta = 5m^2 - 2m + 9. \quad \underline{4}$$

2.1.2. Now, prove that the roots of the given equation will always be real and unequal, for all real values of m . 5 (5)

2.2. If $\frac{2}{3}$ is one root of

$$x(3x - k) = 10$$

calculate the value(s) of k . (2)

QUESTION 3 [16 marks]

CALCULATORS MAY NOT BE USED IN THIS QUESTION

3.1. Multiply out and simplify as far as possible :

3.1.1. $3x^{\frac{1}{2}} \left(x^{-\frac{1}{2}} - 2\sqrt{x} \right)$ 2

3.1.2. $\frac{4 - (2 - 3\sqrt{5})^2}{\sqrt{5} + 1}$ leaving your answer in the form $a + b\sqrt{c}$
where $a, b \in \mathbb{Q}$ and $c \in \mathbb{N}$ 4

3.1.3. $\sqrt[6]{16} \times \sqrt[6]{4}$ 2

3.1.4. $\sqrt{\sqrt[3]{x^{\frac{2}{3}}}}$ 2 (10)

3.2. Factorise fully :

3.2.1. $3^{2x} - 3^{2x-3}$ 3

3.2.2. $12x^{\frac{7}{3}} + x^{\frac{5}{3}} - 6x$ 3 (6)

QUESTION 4 [11 marks]

4.1. Calculate the value(s) of x in the following quadratic sequence :

$$3 ; x ; 3x - 8 ; 4x + 1 \quad (4)$$

4.2. Given : $2 ; -4 ; -12 ; -22 ; \dots$

4.2.1. Determine the n -th term of the given sequence. 4

4.2.2. Now, determine the n -th term of the following sequence :

$$(2) \times (2) ; (-1) \times (-4) ; (-4) \times (-12) ; (-7) \times (-22) ; \dots \quad \underline{3} \quad (7)$$

QUESTION 5 [11 marks]

5. Given : $f(x) = -\frac{4}{x+2} - 3$

5.1. Name this type of graph. (1)

5.2. Sketch the graph of f . (5)

5.3. Show that $f(x) = -\frac{3x+10}{x+2}$ (3)

5.4. Write down the equation of the axis of symmetry of g , if

$$g(x) = f(x) \quad (x < -2) \quad (1)$$

5.5. State the equation of the vertical asymptote of h , if

$$h(x) = f(x - 3) \quad (1)$$

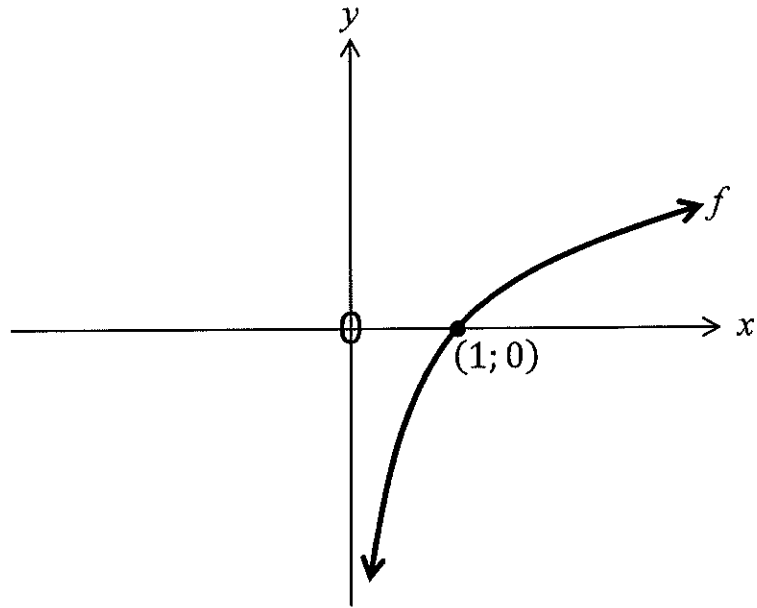
QUESTION 6 [11 marks]

USE THE ANSWER SHEET PROVIDED

- 6.1. On the given set of axes, sketch :
- 6.1.1. an accurate graph of $y = x$, using your protractor 2
- 6.1.2. the reflection of f in the line $y = x$. 2 (4)
- 6.2. Given : $g(x) = -3x^2 + 2$
- 6.2.1. Calculate the average gradient of g between $x = -4$ and $x = 5$. 3
- 6.2.2. Determine the equation of the reflection of g in the line $y = x$. 4 (7)
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6.1.1. and 6.1.2.



6.2.1.		
6.2.2.		