Class	Register Number	Name

南洋女子中学校
NANYANG GIRLS' HIGH SCHOOL

Mid-Year Examination 2014
Secondary Two

INTEGRATED MATHEMATICS 1 hour
Paper 1
Monday **12 May 2014** **0845 - 0945**

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Write your name, register number and class in the spaces at the top of this page.
2. Answer **all** the questions.
3. Write your answers and working in the spaces provided on the question paper.
4. **All working must be written in dark blue or black ink.**
5. **Omission of essential working will result in loss of marks.**
6. Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
7. The use of calculators is allowed for this paper.

INFORMATION FOR CANDIDATES

1. The number of marks is given in brackets [ ] at the end of each question or part question.
2. The total number of marks for this paper is 40.
3. You are reminded of the need for clear presentation in your answers.

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1. Solve the following equations:

(a) $3y^2 = 5y$,

(b) $(2x+1)(x-3) = (x+3)(x-3)$.

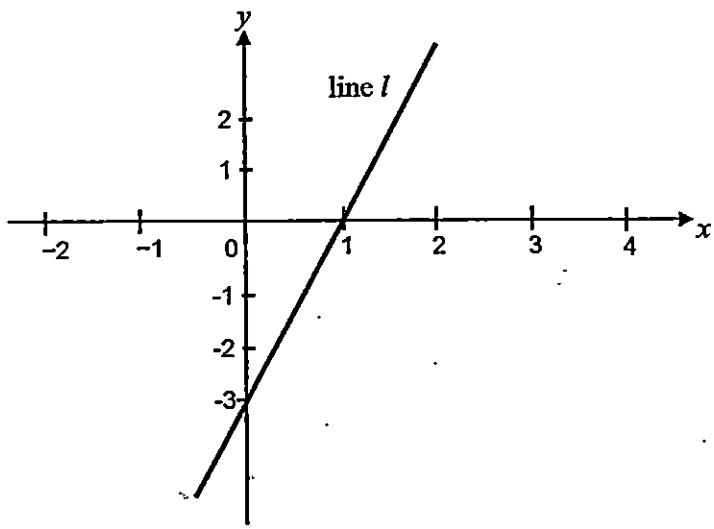
Answer : (a) $y =$ _____ [2]

(b) $x =$ _____ [3]

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2.



(a) Show that the equation of line l can be written as $3x - y = 3$. [2]

(b) $(8, p)$ is a point on line l. Find the value of p.

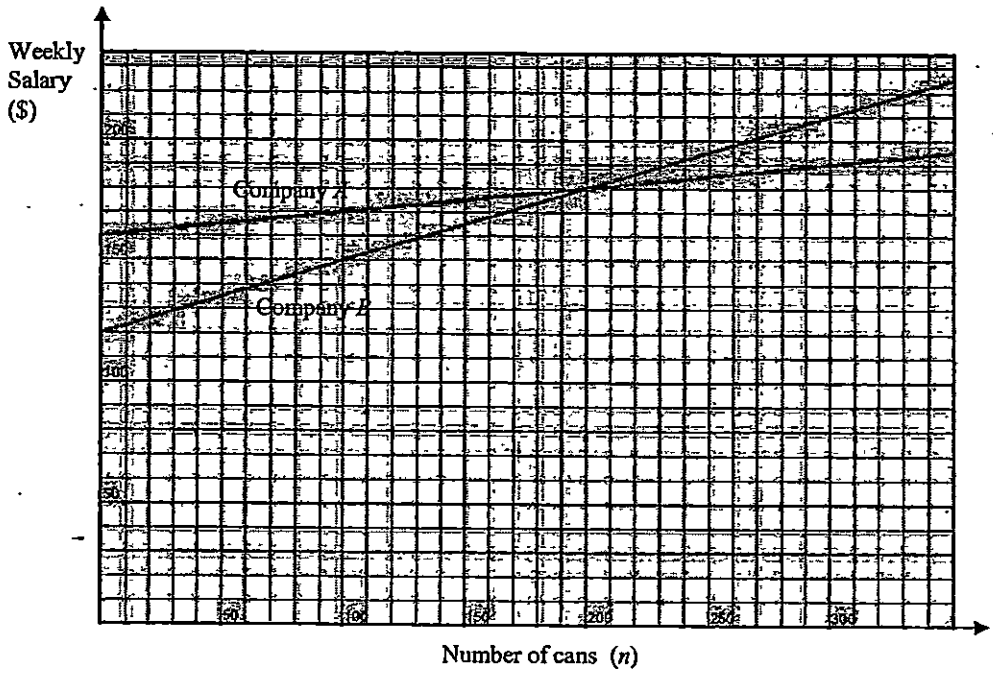
(c) Find the equation of line k that is parallel to line l and passes through $(-2, 1)$.

Answer : (b) $p =$ _____ [1]

(c) _____ [2]

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3.



The graphs above show the amount of weekly salary offered by two different canned food companies, Company A and Company B, based on the number of cans sold. The weekly salary offered by Company B is represented by the equation $S = kn + p$, where S is the amount of salary in dollars and n is the number of cans sold.

(a) State the value of p and explain its significance.

(b) Calculate the value of k and explain its significance.

(c) Mandy is interested to be a sales promoter in either Company A or B. In her previous company, she consistently sells at least 210 cans per week. Which company would you recommend Mandy to apply for the job? State your reason clearly.

Answer : (a) $p =$ _____; Significance: _____

_____ [2]

(b) $k =$ _____; Significance: _____

_____ [2]

(c) _____

_____ [2]

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4. Make x the subject of the following formulae:

(a) $\frac{1}{y}-\frac{2}{x}=1$,

(b) $(y+1)^2=2-3(x-a)^2$.

Answer :(a) $x=$_____ [3]

(b) $x=$_____ [4]

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5. Express x in terms of t.

$\sqrt{\frac{x^2+15t-3}{x^2}} = 5t$, where $t \geq 0, x \neq 0$.

Answer: $x =$ _____ [4]

[Turn Over

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6. **Simplify the following and express as a single fraction.**

(a) $(-2bc+8b)\times\dfrac{(-2a^3b)^2}{a^5b(c-4)^2}$,

(b) $3(ab)^2\div\dfrac{2a^4-32b^4}{a^2-ab-2b^2}\times\dfrac{(a+2b)^2}{9a^4b^2}$.

Answer :(a) _____ [3]

(b) _____ [5]

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7. Solve the following pair of simultaneous equations.

$2y^2 - xy + 2x = 3$

$2x + 1 = 3y$

Answer: $x =$ _____, $y =$ _____

or $x =$ _____, $y =$ _____ [5]

End of Paper 1

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Class	Register Number	Name

南洋女子中学校
NANYANG GIRLS' HIGH SCHOOL

Mid-Year Examination 2014
Secondary Two

INTEGRATED MATHEMATICS 1 hour
Paper 2
Thursday **8 May 2014** **1030 - 1130**

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Write your name, register number and class in the spaces at the top of this page.
2. Answer all the questions.
3. Write your answers and working on the separate answer paper provided.
4. **All working must be written in dark blue or black ink.**
5. **Omission of essential working will result in loss of marks.**
6. Write your name, register number and class on each separate sheet of paper that you use and fasten the separate sheets together with the string provided. Do not staple your answer sheets together.
7. Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
8. The use of calculators is allowed for this paper.

INFORMATION FOR CANDIDATES

1. The number of marks is given in brackets [ ] at the end of each question or part question.
2. The total number of marks for this paper is 40.
3. You are reminded of the need for clear presentation in your answers.

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1 (a) Sketch the following graphs on the **same** axes. Label your graphs and the intercepts (if any) clearly.

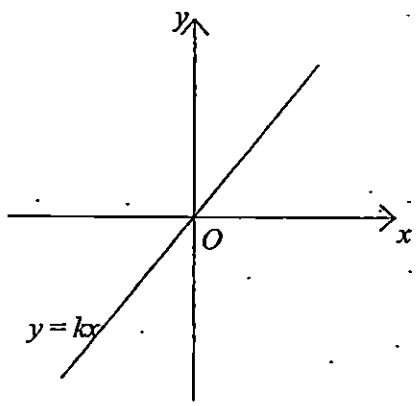
(i) $x=-3$, [1]

(ii) $y=2$, [1]

(iii) $y=2x+1$, [2]

(iv) $2y-x+11=0$. [2]

(b) The graph of $y=kx$, where $k>0$, is shown below. **Copy the graph onto your answer script** and sketch $y=2kx+c$, where $c<0$, on the **same** axes. Label your graphs and the intercepts (if any) clearly. [2]



2 (a) Given the expression

$$\frac{4-x}{-2x^2+9x-4},\ x\neq 4,$$

state another value of x that makes the equation invalid. [1]

(b) Simplify the above expression. [2]

(c) Hence, solve the following equation:

$$\frac{4-x}{-2x^2+9x-4}+\frac{4}{4x-2}=\frac{x+4}{x^2-16}$$ [4]

3 $(a,1)$ is a solution of the following simultaneous equations, $ax=7+by$ and $ay=3b-x$. Find the values of a and b. [5]

[Turn Over

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4 Paul wanted to buy x kg of coffee powder that would cost him \$60.

(a) Write down an expression, in terms of x, for the cost price of 1 kg of coffee powder. [1]

(b) He decided to buy tea leaves instead after he realised that he could get an extra 3 kg of tea leaves for the same amount of money. Write down an expression, in terms of x, for the cost price of 1 kg of tea leaves. [1]

(c) The cost price of 1 kg of coffee powder is \$4.50 more than that of 1 kg of tea leaves. Form an equation in x and show that it reduces to $x^2+3x-40=0$. [3]

(d) Solve the equation in (c). [2]

(e) Hence, find the cost price of 1 kg of tea leaves. [1]

5 **Answer the whole of this question on a sheet of graph paper.**

The variables x and y are connected by the equation $y = 2x^2 + 3x - 1$. The following table shows some corresponding values of x and y.

x	-5	-4	-3	-2	-1	0	1	2	3
y	34	a	8	1	-2	-1	4	b	26

(a) Calculate the values of a and b. [2]

(b) Using a scale of 2 cm to represent 1 unit, draw a horizontal x-axis for $-5 \le x \le 3$. Using a scale of 2 cm to represent 5 units, draw a vertical y-axis for $-5 \le y \le 35$. Plot the graph of $y = 2x^2 + 3x - 1$, for $-5 \le x \le 3$. [3]

(c) From your graph, find

(i) the value of y when $x = 2.2$, [1]

(ii) the values of x when $y = 20$, [2]

(iii) the coordinates of the point where y is the minimum. [1]

(d) State the equation of the line of symmetry. [1]

(e) By drawing a suitable straight line on the same axes, use your graphs to solve the following equation $2x^2 + 3x - 11 = 0$ for the range $-5 \le x \le 3$. [2]

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Bonus Question

6 A complex number z can be represented as $z = x + yi$; where x and y are both real number, and $i = \sqrt{-1}$ and $i^2 = -1$. Show that two complex numbers, $z = \frac{3}{2} \pm \frac{i}{2}$, are solutions of the quadratic equation $2z^2 - 6z + 5 = 0$. [2]

End of Paper 2

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Sec 2 MYE 2014 Solutions (Paper 1)

1a	$3y^2 = 5y$ $y(3y-5) = 0$ $y = 0$ or $y = 1\frac{2}{3}$
1b	$(2x+1)(x-3) = (x+3)(x-3)$ $(x-3)(2x+1-x-3) = 0$ $(x-3)(x-2) = 0$ $x = 3$ or $x = 2$ or $(2x+1)(x-3) = (x+3)(x-3)$ $2x^2 - 5x - 3 = x^2 - 9$ $x^2 - 5x + 6 = 0$ $(x-3)(x-2) = 0$ $x = 3$ or $x = 2$
2a	Using two points (0, -3) and (1, 0), gradient $= \frac{0-(-3)}{1-0}$ $= 3$ y-intercept = -3 Equation of the line: $y = 3x - 3$ $3x - y = 3$
2b	$p = 21$
2c	The equation of line k is $y = 3x + C$ Sub $x = -2, y = 1$ into the equation. $1 = 3(-2) + C$ $C = 7$ The equation is $y = 3x + 7$

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3a	$p = 120$ The fixed amount of salary Other accepted answers: Basic salary, minimum/lowest salary, salary when no can is sold.
3b	$k = 0.3$ For every additional 1 can sold, the salary increases by \$0.30 (or 30 cents)
3c	Company B. When the number of cans sold is greater than 200, company B offer higher salary than company A, OR when $n = 210$, company B offers higher salary (\$185) than company A (\$180).
4a	$\frac{1}{y} - \frac{2}{x} = 1$ $\frac{2}{x} = \frac{1}{y} - 1$ $\frac{2}{x} = \frac{1-y}{y}$ $2y = x(1-y)$ $x = \frac{2y}{1-y}$
4b	$(y+1)^2 = 2 - 3(x-a)^2$ $2 - (y+1)^2 = 3(x-a)^2$ $(x-a)^2 = \frac{2-(y+1)^2}{3}$ $x - a = \pm\sqrt{\frac{2-(y+1)^2}{3}}$ $x = a \pm \sqrt{\frac{2-(y+1)^2}{3}}$

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5	$\sqrt{\frac{x^2+15t-3}{x^2}}=5t$ $\frac{x^2+15t-3}{x^2}=25t^2$ $x^2+15t-3=25x^2t^2$ $x^2-25x^2t^2=3-15t$ $x^2(1-25t^2)=3-15t$ $x^2=\frac{3-15t}{1-25t^2}$ $x^2=\frac{3(1-5t)}{(1+5t)(1-5t)}$ $x=\pm\sqrt{\frac{3}{1+5t}}$
6a	$(-2bc+8b)\times\frac{(-2a^3b)^2}{a^5b(c-4)^2}$ $=[-2b(c-4)]\times\frac{4a^6b^2}{a^5b(c-4)^2}$ $=\frac{-8ab^2}{c-4}$
6b	$3(ab)^2\div\frac{2a^4-32b^4}{a^2-ab-2b^2}\times\frac{(a+2b)^2}{9a^4b^2}$ $=3a^2b^2\times\frac{(a-2b)(a+b)}{2(a^2+4b^2)(a-2b)(a+2b)}\times\frac{(a+2b)^2}{9a^4b^2}$ $=\frac{(a+2b)(a+b)}{6a^2(a^2+4b^2)}$

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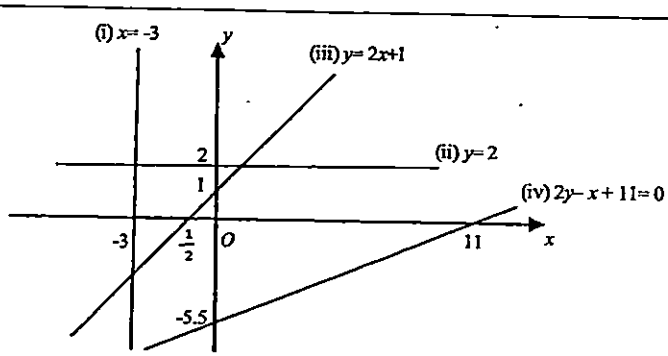
7	$2y^2 - xy + 2x = 3$ ---(1) $2x + 1 = 3y$ ---(2) From (2) $2x = 3y - 1$ $x = \frac{3y-1}{2}$ ---(2a) Sub (2a) into (1) $2y^2 - y\left(\frac{3y-1}{2}\right) + 3y - 1 = 3$ $2y^2 - \frac{3y^2 - y}{2} + 3y - 1 = 3$ $4y^2 - 3y^2 + y + 6y - 2 = 6$ $y^2 + 7y - 8 = 0$ $(y+8)(y-1) = 0$ $y = -8$ or $y = 1$ $\therefore x = -12\frac{1}{2}, y = -8$ or $x = 1, y = 1$

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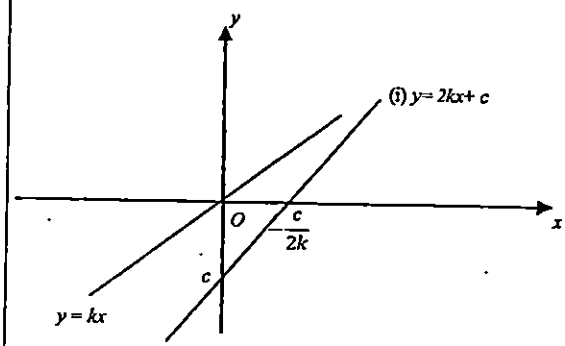
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Sec 2 MYE 2014 Solution (Paper 2)

1a



1b



2a

$x = 0.5$

2b

$$\frac{4-x}{-2x^2+9x-4}$$
$$=\frac{4-x}{(-2x+1)(x-4)}$$
$$=\frac{1}{2x-1}$$

2c

$$\frac{4-x}{-2x^2+9x-4}+\frac{4}{4x-2}=\frac{x+4}{x^2-16}$$
$$\frac{1}{2x-1}+\frac{4}{2(2x-1)}=\frac{x+4}{(x+4)(x-4)}$$
$$\frac{1}{2x-1}+\frac{2}{2x-1}=\frac{1}{x-4}$$
$$\frac{3}{2x-1}=\frac{1}{x-4}$$
$$3x-12=2x-1$$
$$x=11$$

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3	At $(a,1)$, $a^2 = 7 + b$ ---(1) $a = 3b - a$ $2a - 3b = 0$ ---(2) From (2), $b = \frac{2}{3}a$ ---(2a) Sub (2a) into (1) $a^2 = 7 + \frac{2}{3}a$ $3a^2 - 2a - 21 = 0$ $(3a+7)(a-3) = 0$ $a = -\frac{7}{3}$ or $a = 3$ Sub $a = -\frac{7}{3}$ into (2a): $b = \frac{-14}{9}$ Sub $a = 3$ into (2a): $b = 2$ $\therefore a = 3, b = 2$ or $a = -2\frac{1}{3}, b = -1\frac{5}{9}$
4a	$\frac{60}{x}$
4b	$\frac{60}{x+3}$
4c	$\frac{60}{x} = \frac{60}{x+3} + 4.5$ $\frac{60x + 180 - 60x}{x(x+3)} = 4.5$ $180 = 4.5x^2 + 13.5x$ $4.5x^2 + 13.5x - 180 = 0$ $x^2 + 3x - 40 = 0$ (shown)
4d	$(x+8)(x-5) = 0$ $x = -8$ or $x = 5$
4e	Cost $= \frac{60}{5+3}$ $= \$7.50$

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5	See the graph paper.

6. [BONUS]

Substitute $z=\frac{3}{2}+\frac{i}{2}$ into the LHS of the equation:

$$\begin{aligned}\text{LHS} &= 2\left(\frac{3}{2}+\frac{i}{2}\right)^2-6\left(\frac{3}{2}+\frac{i}{2}\right)+5\\ &= 2\left(\frac{9}{4}+\frac{3i}{2}-\frac{1}{4}\right)-9-3i+5\\ &= 4+3i-9-3i+5\\ &= 0\\ &= \text{RHS}\end{aligned}$$

Therefore, $z=\frac{3}{2}+\frac{i}{2}$ is a solution.

Substitute $z=\frac{3}{2}-\frac{i}{2}$ into the LHS of the equation:

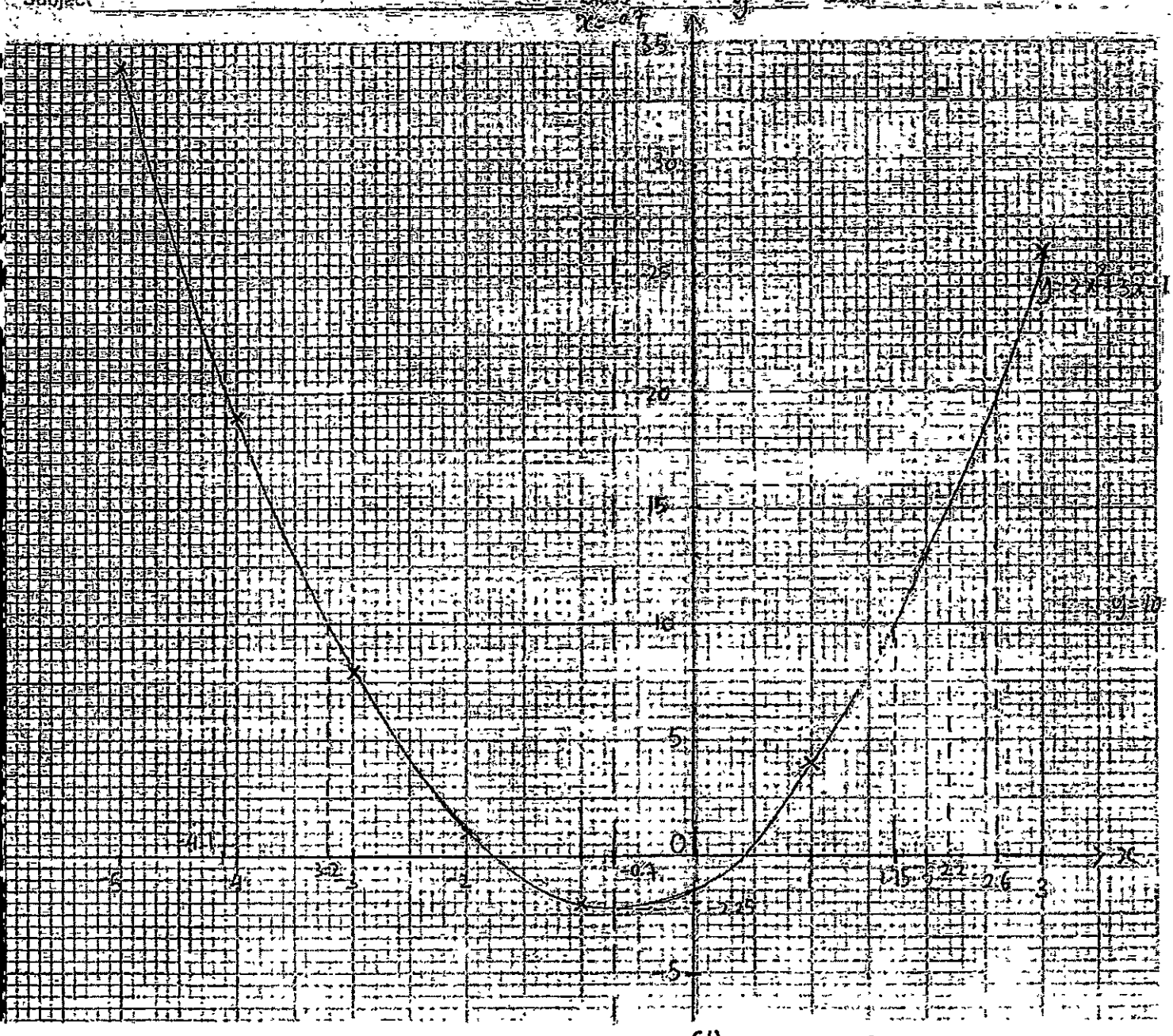
$$\begin{aligned}\text{LHS} &= 2\left(\frac{3}{2}-\frac{i}{2}\right)^2-6\left(\frac{3}{2}-\frac{i}{2}\right)+5\\ &= 2\left(\frac{9}{4}-\frac{3i}{2}-\frac{1}{4}\right)-9+3i+5\\ &= 4-3i-9-3i+5\\ &= 0\\ &= \text{RHS}\end{aligned}$$

Therefore, $z=\frac{3}{2}-\frac{i}{2}$ is a solution

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Name _____ Index No. _____

Subject _____ Class _____ Date _____



(a) $a = 19$, $b = 13$

(b) See the graph

(c) (i) $y = 15$

(ii) $x = -4.1$ or $x = 2.6$

(iii) $(-0.7, -2.25)$

(d) $x = -0.7$

(e) Line to be drawn: $y = 10$

$x = -3.2$ or $x = 1.75$

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