Graphs
Difficulty: Medium

Question Paper 4

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Graphs
Paper	Paper 4
Difficulty	Medium
Booklet	Question Paper 4

Time allowed: **86 minutes**

Score: **/75**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D
>83%	67%	51%	41%	31%

CIE IGCSE Maths (0980)

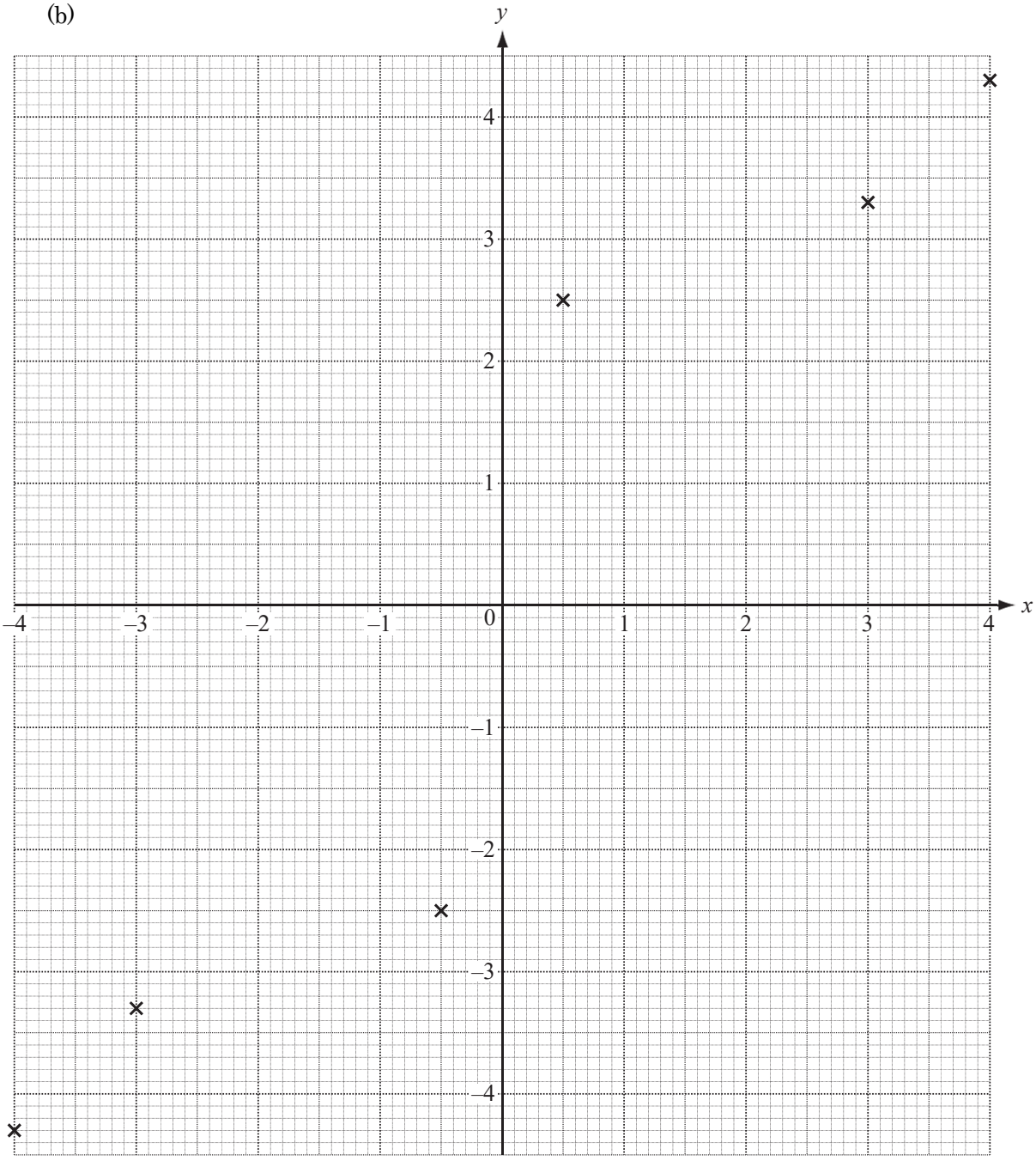
9	8	7	6	5	4
>95%	87%	80%	69%	58%	46%

(a) Complete the table of values for $y = x + \frac{1}{x}$.

x	–4	–3	–2	–1	–0.5	0.5	1	2	3	4
y	–4.3	–3.3			–2.5	2.5			3.3	4.3

[2]

(b)



On the grid, draw the graph of $y = x + \frac{1}{x}$ for $-4 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 4$.

Six of the ten points have been plotted for you.

[3]

(c) There are three integer values of k for which the equation $x + \frac{1}{x} = k$ has **no** solutions.

Write down these three values of k. [2]

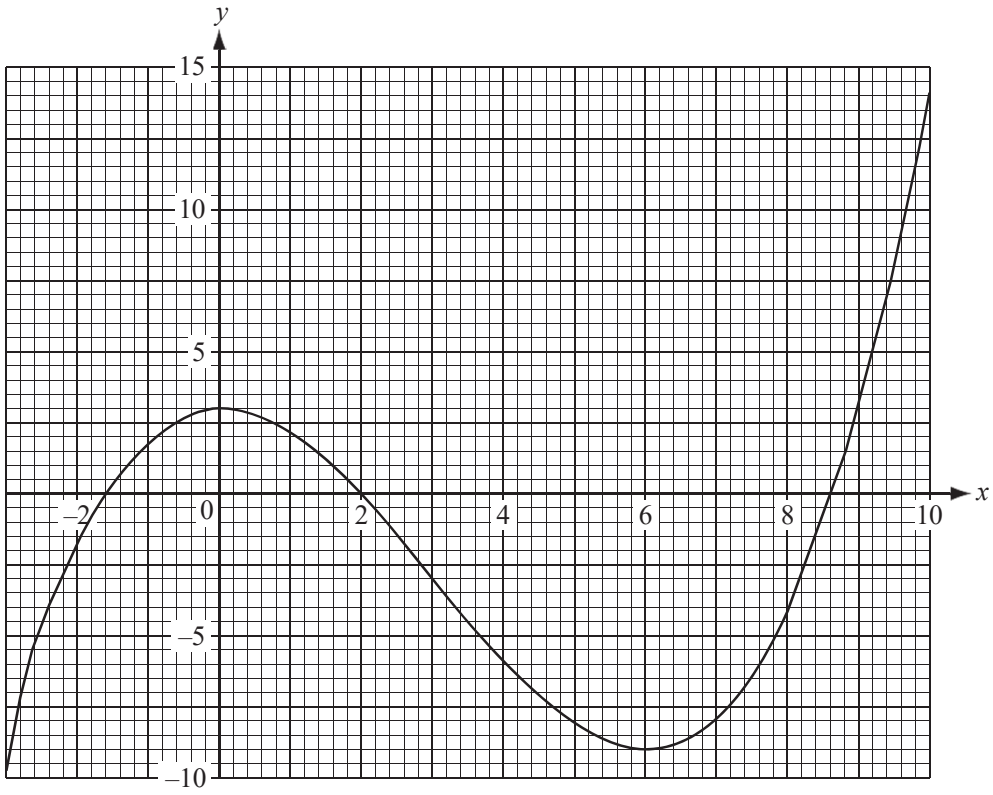
(d) Write down the ranges of x for which the gradient of the graph of $y = x + \frac{1}{x}$ is positive. [2]

(e) To solve the equation $x + \frac{1}{x} = 2x + 1$, a straight line can be drawn on the grid.

(i) Draw this line on the grid for $-2.5 \leqslant x \leqslant 1.5$. [2]

(ii) On the grid, show how you would find the solutions. [1]

(iii) Show how the equation $x + \frac{1}{x} = 2x + 1$ can be rearranged into the form $x^2 + bx + c = 0$ and find the values of b and c. [3]



The diagram shows the accurate graph of $y = f(x)$.

(a) Use the graph to find

(i) f(0), [1]

(ii) f(8). [1]

(b) Use the graph to solve

(i) $f(x) = 0$, [2]

(ii) $f(x) = 5$. [1]

(c) k is an integer for which the equation $f(x) = k$ has exactly two solutions.

Use the graph to find the two values of k. [2]

(d) Write down the range of values of x for which the graph of $y = f(x)$ has a negative gradient. [2]

(e) The equation $f(x) + x - 1 = 0$ can be solved by drawing a line on the grid.

(i) Write down the equation of this line. [1]

(ii) How many solutions are there for $f(x) + x - 1 = 0$? [1]

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

$$f(x) = 3x - \frac{1}{x^2} + 3, \quad x \neq 0.$$

(a) The table shows some values of f(x).

x	−3	−2.5	−2	−1.5	−1	−0.5	−0.4	−0.3	0.3	0.4	0.5	1	1.5	2	2.5	3
f(x)	p	−4.7	−3.3	−1.9	−1	−2.5	−4.5	−9.0	−7.2	−2.1	0.5	q	7.1	8.8	10.3	r

Find the values of p, q and r. [3]

(b) Draw axes using a scale of 1 cm to represent 0.5 units for $-3 \leqslant x \leqslant 3$ and 1 cm to represent units for $-10 \leqslant y \leqslant 12$. [1]

(c) On your grid, draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 3$. [5]

(d) Use your graph to solve the equations

(i) $3x - \frac{1}{x^2} + 3 = 0$, [1]

(ii) $3x - \frac{1}{x^2} + 7 = 0$. [3]

(e) $g(x) = 3x + 3$.
On the same grid, draw the graph of $y = g(x)$ for $-3 \leqslant x \leqslant 3$. [2]

[1]

(f) (i) Describe briefly what happens to the graphs of $y = f(x)$ and $y = g(x)$ for large positive or negative values of x.

(ii) Estimate the gradient of $y = f(x)$ when $x = 100$. [1]

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

(a) Find the values of k, m and n in each of the following equations, where $a > 0$.

(i) $a^0 = k$, [1]

(ii) $a^m = \frac{1}{a}$, [1]

(iii) $a^n = \sqrt{a^3}$. [1]

(b) The table shows some values of the function $f(x) = 2^x$.

x	−2	−1	−0.5	0	0.5	1	1.5	2	3
f(x)	r	0.5	0.71	s	1.41	2	2.83	4	t

(i) Write down the values of r, s and t. [3]

(ii) Using a scale of 2 cm to represent 1 unit on each axis, draw an x-axis from −2 to 3 and a y-axis from 0 to 10. [1]

(iii) On your grid, draw the graph of $y = f(x)$ for $-2 \leqslant x \leqslant 3$. [4]

(c) The function g is given by $g(x) = 6 - 2x$.

(i) On the same grid as **part (b)**, draw the graph of $y = g(x)$ for $-2 \leqslant x \leqslant 3$. [2]

(ii) Use your graphs to solve the equation $2 = 6 - 2x$. [1]

(iii) Write down the value of x for which $2 < 6 - 2x$ for $x \in \{\text{positive integers}\}$. [1]

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

The table gives values of $f(x) = 2^x$, for $-2 \leqslant x \leqslant 4$.

x	-2	-1	0	1	2	3	4
f(x)	p	0.5	q	2	4	r	16

(a) Find the values of p, q and r. [3]

(b) Using a scale of 2 cm to 1 unit on the x-axis and 1 cm to 1 unit on the y-axis, draw the graph of $y = f(x)$ for $-2 \leqslant x \leqslant 4$. [5]

(c) Use your graph to solve the equation $2^x = 7$. [1]

(d) What value does f(x) approach as x decreases? [1]

(e) By drawing a tangent, estimate the gradient of the graph of $y = f(x)$ when $x = 1.5$. [3]

(f) On the same grid draw the graph of $y = 2x + 1$ for $0 \leqslant x \leqslant 4$. [2]

(g) Use your graph to find the non-integer solution of $2^x = 2x + 1$. [2]