

Graphs

Difficulty: Hard

Question Paper 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Graphs
Paper	Paper 4
Difficulty	Hard
Booklet	Question Paper 3

Time allowed: 132minutes

Score: /115

Percentage: /100

Grade Boundaries:

CIE IGCSE Maths (0580)

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

CIE IGCSE Maths (0980)

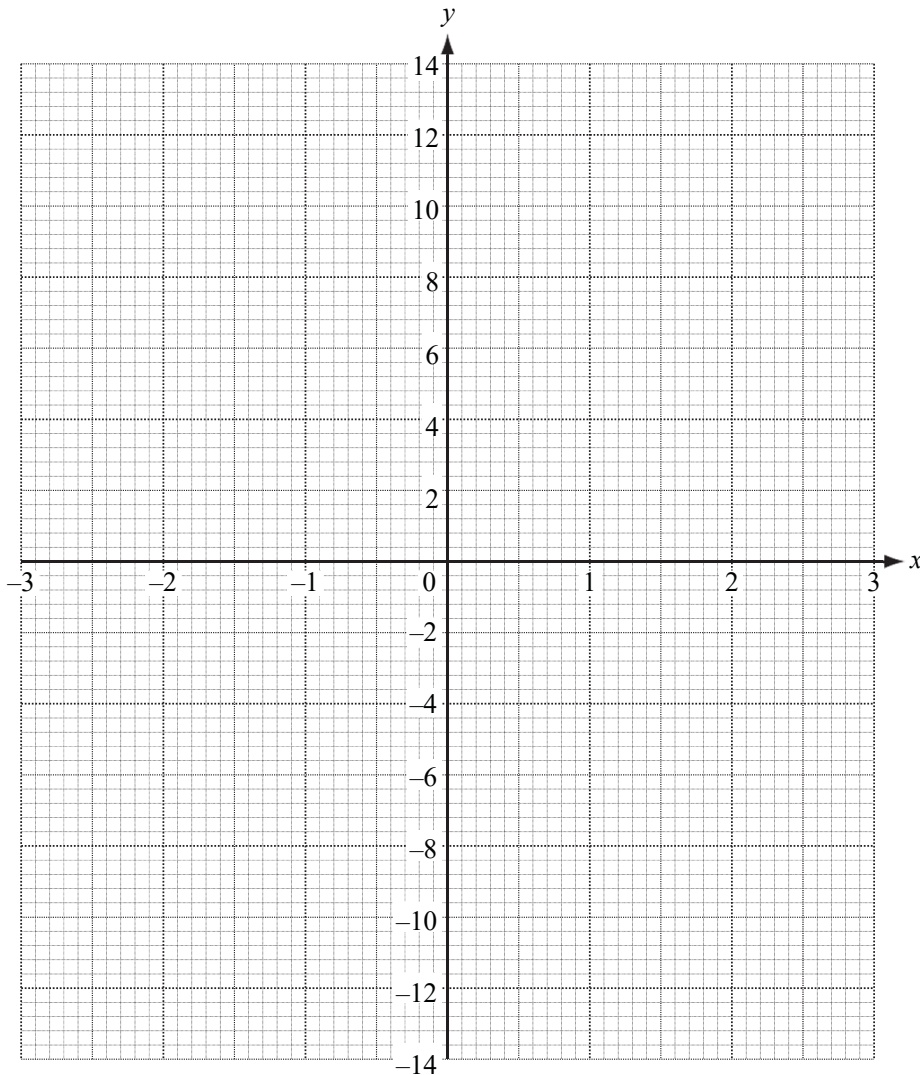
9	8	7	6	5	4
>95%	87%	80%	69%	58%	46%

Question 1

- (a) Complete the table of values for the function $y = x^2 - \frac{3}{x}$, $x \neq 0$. [3]

x	-3	-2	-1	-0.5	-0.25		0.25	0.5	1	2	3
y	10	5.5		6.3	12.1		-11.9			2.5	8

- (b) Draw the graph of $y = x^2 - \frac{3}{x}$ for $-3 \leq x \leq -0.25$ and $0.25 \leq x \leq 3$. [5]



(c) Use your graph to solve $x^2 - \frac{3}{x} = 7$. [3]

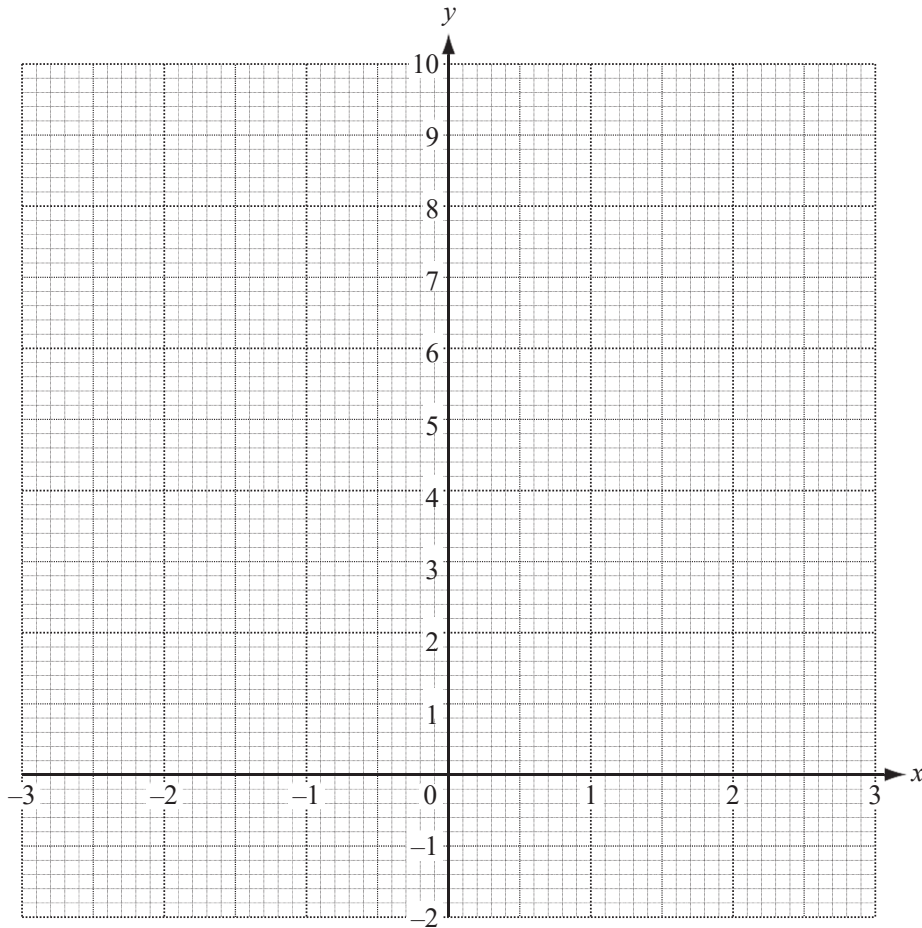
(d) Draw the tangent to the curve where $x = -2$.
Use the tangent to calculate an estimate of the gradient of the curve where $x = -2$. [3]

Question 2

- (a) Complete the table of values for the function $f(x)$, where $f(x) = x^2 + \frac{1}{x^2}$, $x \neq 0$. [3]

x	-3	-2.5	-2	-1.5	-1	-0.5	0.5	1	1.5	2	2.5	3
$f(x)$		6.41		2.69		4.25	4.25		2.69		6.41	

- (b) On the grid, draw the graph of $y = f(x)$ for $-3 \leq x \leq -0.5$ and $0.5 \leq x \leq 3$. [5]



(c) (i) Write down the equation of the line of symmetry of the graph. [1]

(ii) Draw the tangent to the graph of $y = f(x)$ where $x = -1.5$.
Use the tangent to estimate the gradient of the graph of $y = f(x)$ where $x = -1.5$. [3]

(iii) Use your graph to solve the equation $x^2 + \frac{1}{x^2} = 3$. [2]

(iv) Draw a suitable line on the grid and use your graphs to solve the equation $x^2 + \frac{1}{x^2} = 2x$. [3]

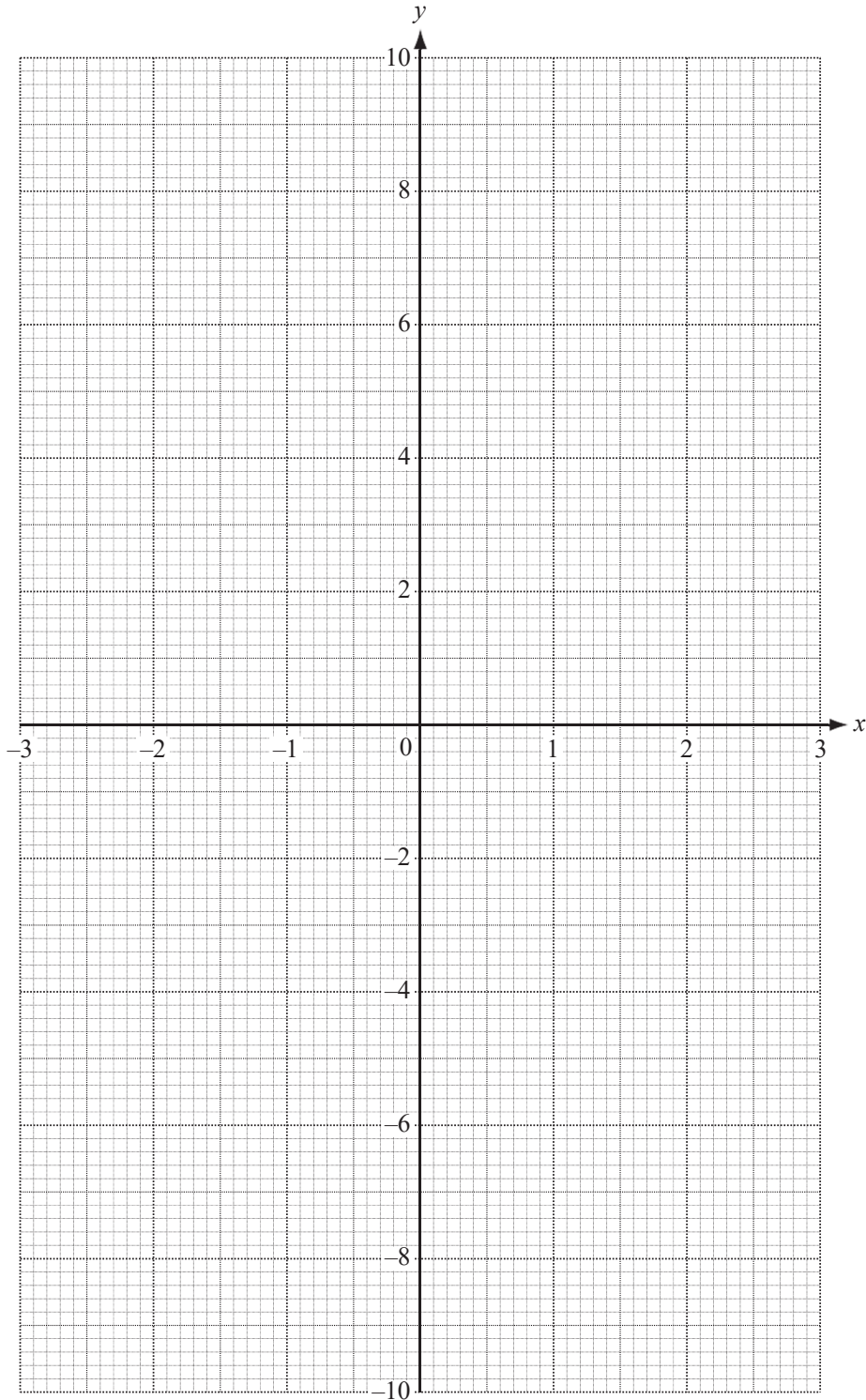
Question 3

(a) Complete the table for the function $f(x) = \frac{2}{x} - x^2$.

x	-3	-2	-1	-0.5	-0.2		0.2	0.5	1	2	3
$f(x)$	-9.7	-5			-10.0		10.0	3.75	1		-8.3

[3]

(b) On the grid draw the graph of $y = f(x)$ for $-3 \leq x \leq -0.2$ and $0.2 \leq x \leq 3$.



[5]

(c) Use your graph to

(i) solve $f(x) = 2$, [1]

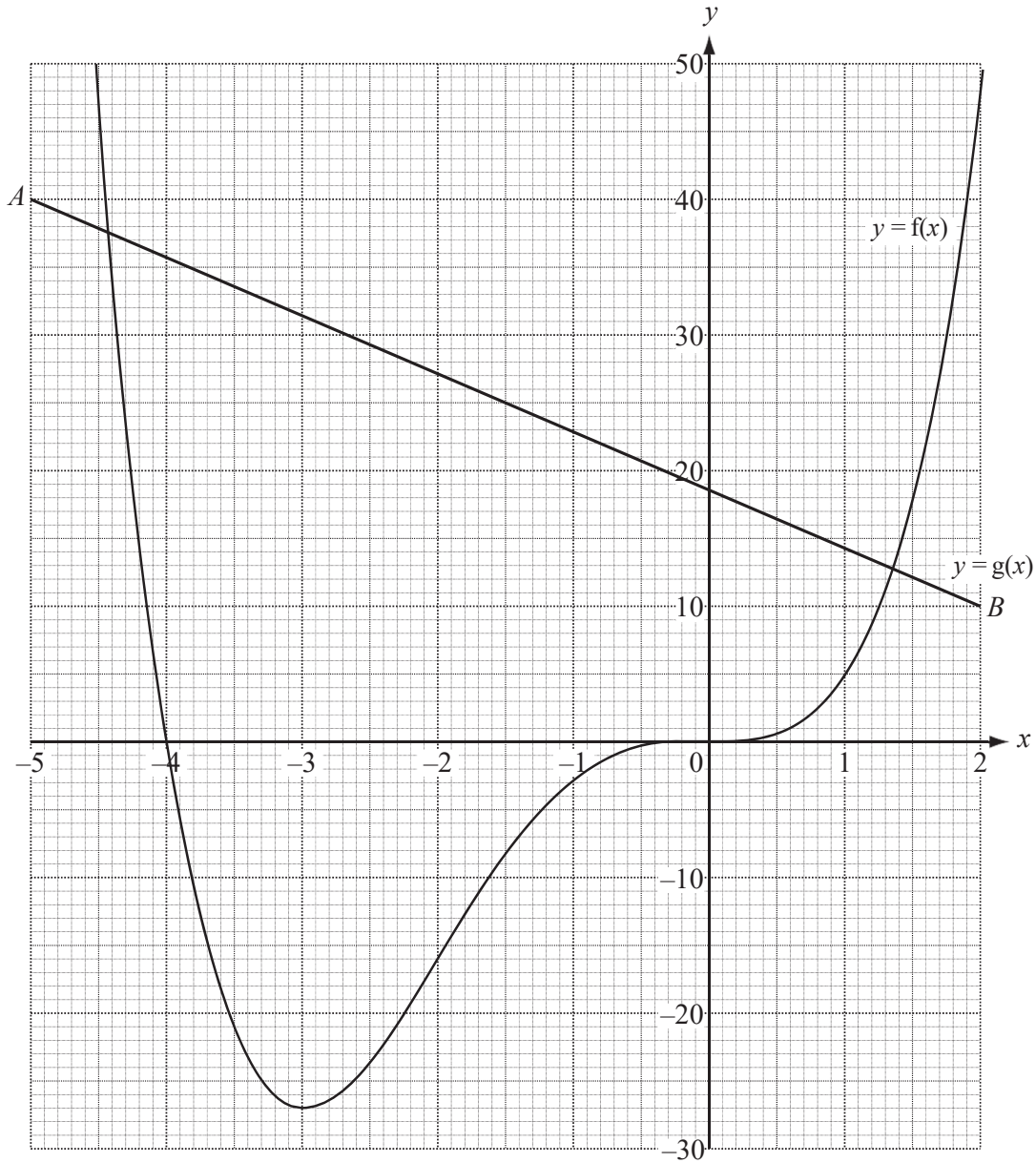
(ii) find a value for k so that $f(x) = k$ has 3 solutions. [1]

(d) Draw a suitable line on the grid and use your graphs to solve the equation $\frac{2}{x} - x^2 = 5x$. [3]

(e) Draw the tangent to the graph of $y = f(x)$ at the point where $x = -2$.

Use it to calculate an estimate of the gradient of $y = f(x)$ when $x = -2$. [3]

Question 4



The graphs of $y = f(x)$ and $y = g(x)$ are shown above.

(a) Find the value of

(i) $f(-2)$, [1]

(ii) $g(0)$. [1]

- (b) Use the graphs to solve
- (i) the equation $f(x) = 20$, [2]
 - (ii) the equation $f(x) = g(x)$, [2]
 - (iii) the inequality $f(x) < g(x)$. [1]
- (c) Use the points A and B to find the gradient of $y = g(x)$ as an exact fraction. [2]
- (d) On the grid, draw the graph of $y = g(x) - 10$. [2]
- (e) (i) Draw the tangent to the graph of $y = f(x)$ at $(-3, -27)$. [1]
- (ii) Write down the equation of this tangent. [1]
- (f) A region, R , contains points whose co-ordinates satisfy the inequalities
- $$-3 \leq x \leq -2, \quad y \leq 40 \quad \text{and} \quad y \geq g(x).$$
- On the grid, draw suitable lines and label this region R . [2]

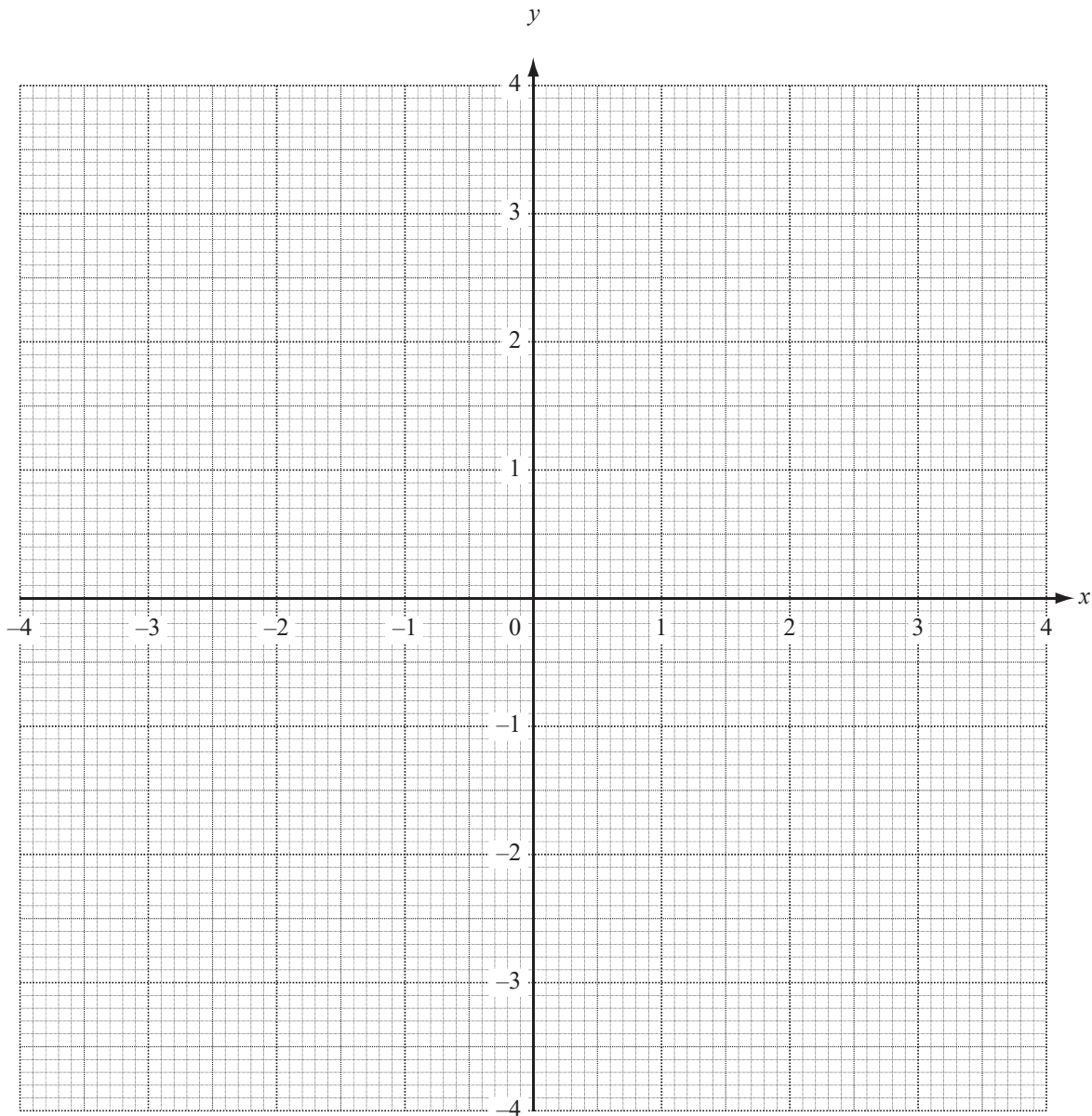
Question 5

(a) The table shows some values for the equation $y = \frac{x}{2} - \frac{2}{x}$ for $-4 \leq x \leq -0.5$ and $0.5 \leq x \leq 4$.

x	-4	-3	-2	-1.5	-1	-0.5	0.5	1	1.5	2	3	4
y	-1.5	-0.83	0	0.58			-3.75		-0.58	0	0.83	1.5

(i) Write the missing values of y in the empty spaces. [3]

(ii) On the grid, draw the graph of $y = \frac{x}{2} - \frac{2}{x}$ for $-4 \leq x \leq -0.5$ and $0.5 \leq x \leq 4$.



[5]

(b) Use your graph to solve the equation $\frac{x}{2} - \frac{2}{x} = 1$. [2]

(c) (i) By drawing a tangent, work out the gradient of the graph where $x = 2$. [3]

(ii) Write down the gradient of the graph where $x = -2$. [1]

(d) (i) On the grid, draw the line $y = -x$ for $-4 \leq x \leq 4$. [1]

(ii) Use your graphs to solve the equation $\frac{x}{2} - \frac{2}{x} = -x$. [2]

(e) Write down the equation of a straight line which passes through the origin and does not intersect the graph of $y = \frac{x}{2} - \frac{2}{x}$. [2]

Question 6

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

The table shows some of the values of the function $f(x) = x^2 - \frac{1}{x}$, $x \neq 0$.

x	-3	-2	-1	-0.5	-0.2	0.2	0.5	1	2	3
y	9.3	4.5	2.0	2.3	p	-5.0	-1.8	q	3.5	r

(a) Find the values of p , q and r , correct to 1 decimal place. [3]

(b) Using a scale of 2 cm to represent 1 unit on the x -axis and 1 cm to represent 1 unit on the y -axis, draw an x -axis for $-3 \leq x \leq 3$ and a y -axis for $-6 \leq y \leq 10$.

Draw the graph of $y = f(x)$ for $-3 \leq x \leq -0.2$ and $0.2 \leq x \leq 3$. [6]

(c) (i) By drawing a suitable straight line, find the three values of x where $f(x) = -3x$. [3]

(ii) $x^2 - \frac{1}{x} = -3x$ can be written as $x^3 + ax^2 + b = 0$.

Find the values of a and b . [2]

(d) Draw a tangent to the graph of $y = f(x)$ at the point where $x = -2$.

Use it to estimate the gradient of $y = f(x)$ when $x = -2$. [3]

Question 7

Answer the whole of this question on a sheet of graph paper.
Use one side for your working and one side for your graphs.

Alaric invests \$100 at 4% per year compound interest.

(a) How many dollars will Alaric have after 2 years? [2]

(b) After x years, Alaric will have y dollars.

He knows a formula to calculate y .

The formula is $y = 100 \times 1.04^x$

x (Years)	0	10	20	30	40
y (Dollars)	100	p	219	q	480

Use this formula to calculate the values of p and q in the table. [2]

(c) Using a scale of 2 cm to represent 5 years on the x -axis and 2 cm to represent \$50 on the y -axis, draw an x -axis for $0 \leq x \leq 40$ and a y -axis for $0 \leq y \leq 500$.

Plot the five points in the table and draw a smooth curve through them. [5]

(d) Use your graph to estimate

(i) how many dollars Alaric will have after 25 years, [1]

(ii) how many years, to the nearest year, it takes for Alaric to have \$200. [1]

(e) Beatrice invests \$100 at 7% per year **simple interest**.

(i) Show that after 20 years Beatrice has \$240. [2]

(ii) How many dollars will Beatrice have after 40 years? [1]

(iii) On the **same grid**, draw a graph to show how the \$100 which Beatrice invests will increase during the 40 years. [2]

(f) Alaric first has more than Beatrice after n years.

Use your graphs to find the value of n .

[1]