

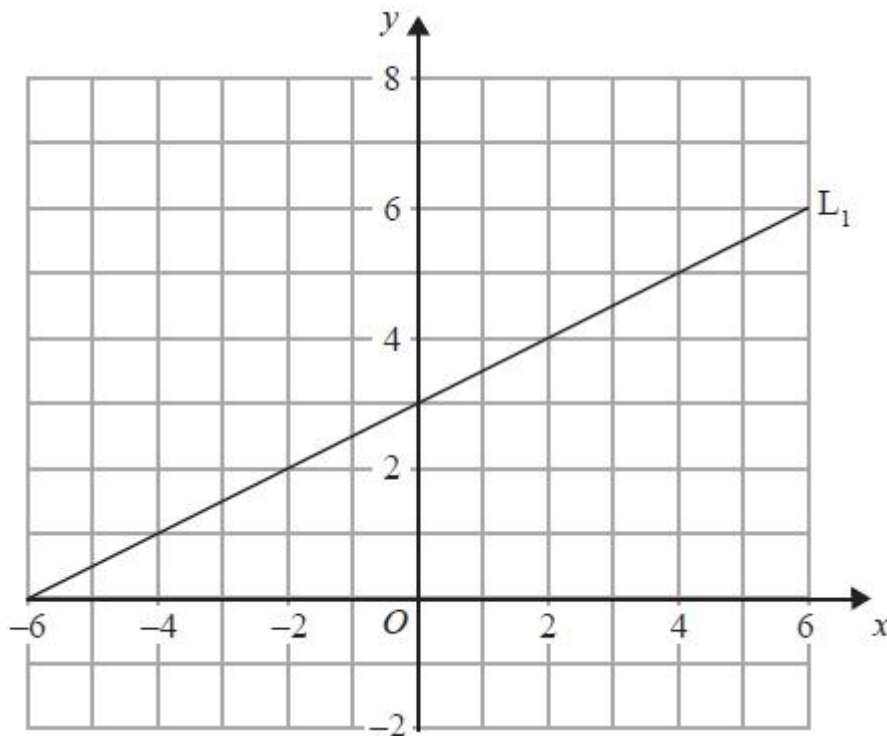
Parallel and Perpendicular Graphs

Things to remember:

- Equations of linear graphs are in the form $y = mx + c$, where m is the gradient and c is the y-intercept.
- Parallel graphs have the same gradient.
- Perpendicular gradients have a product of -1 , eg. $-2 \times \frac{1}{2} = -1$
- Once you have found the required gradient, substitute x , y (a coordinate) and m (the gradient) to calculate c (the y-intercept).

Questions:

1. The diagram shows a straight line, L_1 , drawn on a grid.



A straight line, L_2 , is parallel to the straight line L_1 and passes through the point $(0, -5)$. Find an equation of the straight line L_2 .

.....
(Total for Question is 3 marks)

2. The straight line **L** has equation $y = 2x - 5$
Find an equation of the straight line perpendicular to **L** which passes through $(-2, 3)$.

.....
(Total for Question is 3 marks)

3. Find an equation of the straight line that is perpendicular to the straight line $x + 2y = 5$ and that passes through the point $(3, 7)$.

.....
(Total for Question is 4 marks)

4. In the diagram, ABC is the line with equation $y = -\frac{1}{2}x + 5$
 $AB = BC$
 D is the point with coordinates $(-13, 0)$
 Find an equation of the line through A and D .

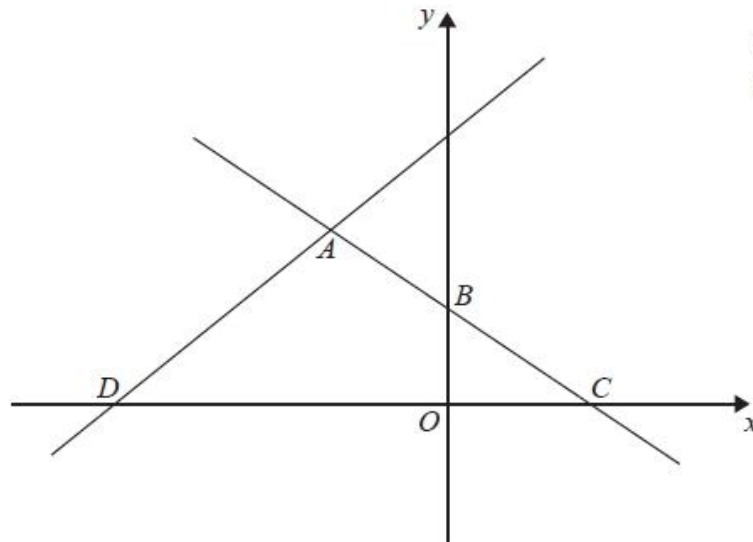


Diagram NOT accurately drawn

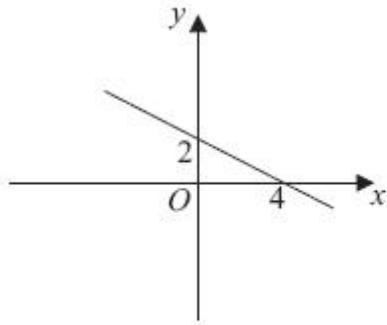
.....
 (Total for question = 5 marks)

5. * **A** and **B** are straight lines.
 Line **A** has equation $2y = 3x + 8$
 Line **B** goes through the points $(-1, 2)$ and $(2, 8)$
 Do lines **A** and **B** intersect?
 You must show all your working.

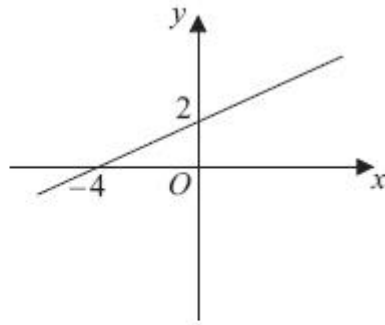
(Total for Question is 3 marks)

6. Here are the graphs of 6 straight lines.

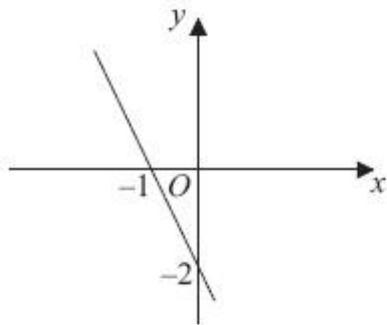
Graph A



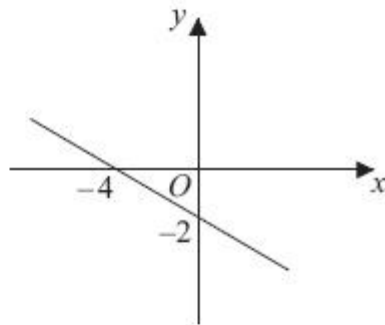
Graph B



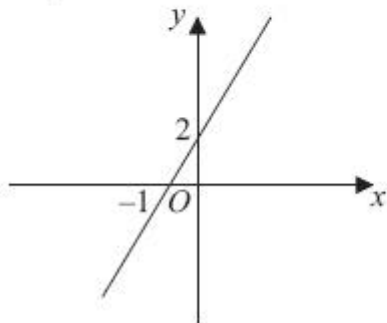
Graph C



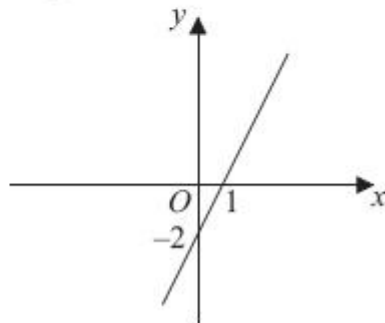
Graph D



Graph E



Graph F



Match each of the graphs **A**, **B**, **C**, **D**, **E** and **F** to the equations in the table.

| | | | | | | |
|-----------------|------------------------|--------------|-------------------------|---------------|--------------|------------------------|
| Equation | $y = \frac{1}{2}x + 2$ | $y = 2x - 2$ | $y = -\frac{1}{2}x + 2$ | $y = -2x - 2$ | $y = 2x + 2$ | $y = -\frac{1}{2} - 2$ |
| Graph | | | | | | |

(Total for Question is 3 marks)

7. In the diagram,
A is the point $(-2, 0)$
B is the point $(0, 4)$
C is the point $(5, -1)$
Find an equation of the line that
passes through C and is perpendicular
to AB.

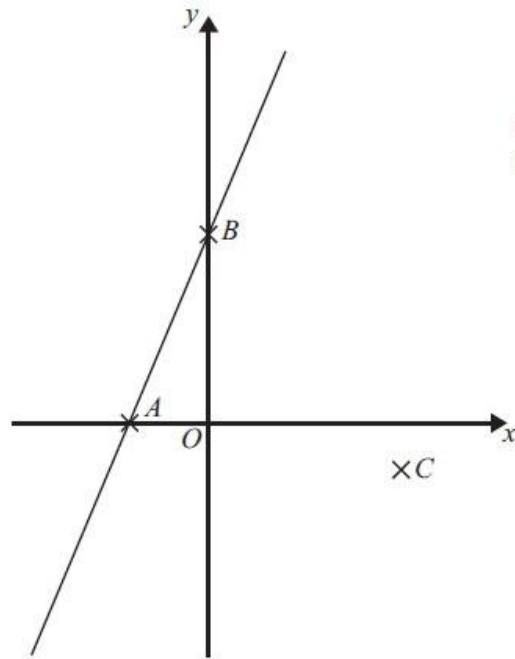


Diagram **NOT**
accurately drawn

.....
(Total for Question is 4 marks)

8. A straight line, L , is perpendicular to the line with equation $y = 1 - 3x$.
The point with coordinates $(6, 3)$ is on the line L .
Find an equation of the line L .

.....
(Total for Question is 3 marks)

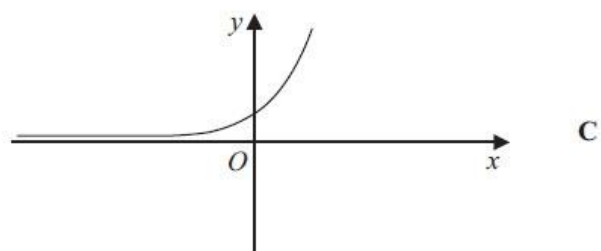
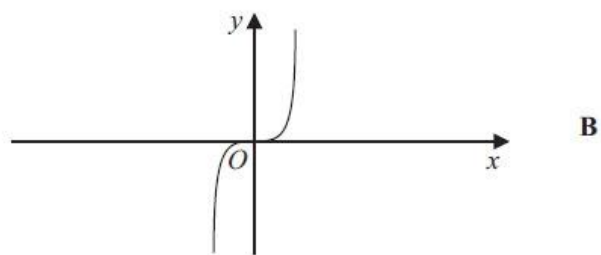
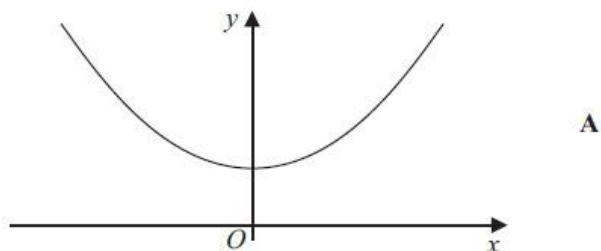
Graphs of Quadratics, Cubics, Reciprocals and Circles

Things to remember:

- A graph where the highest power of x is 2, is a quadratic and is U-shaped (parabola).
- A graph where the highest power of x is 3, is a cubic and is S-shaped.
- A graph with a variable in the denominator is a reciprocal and will have a horizontal and vertical line it will never cross.
- The graph of a circle is in the form $x^2 + y^2 = r^2$, where r is the radius of the circle.

Questions:

1. Here are three graphs.



Here are four equations of graphs.

$$y = x^3 \quad y = x^2 + 4 \quad y = \frac{1}{x} \quad y = 2^x$$

Match each to the correct equation.

A and $y =$

B and $y =$

C and $y =$

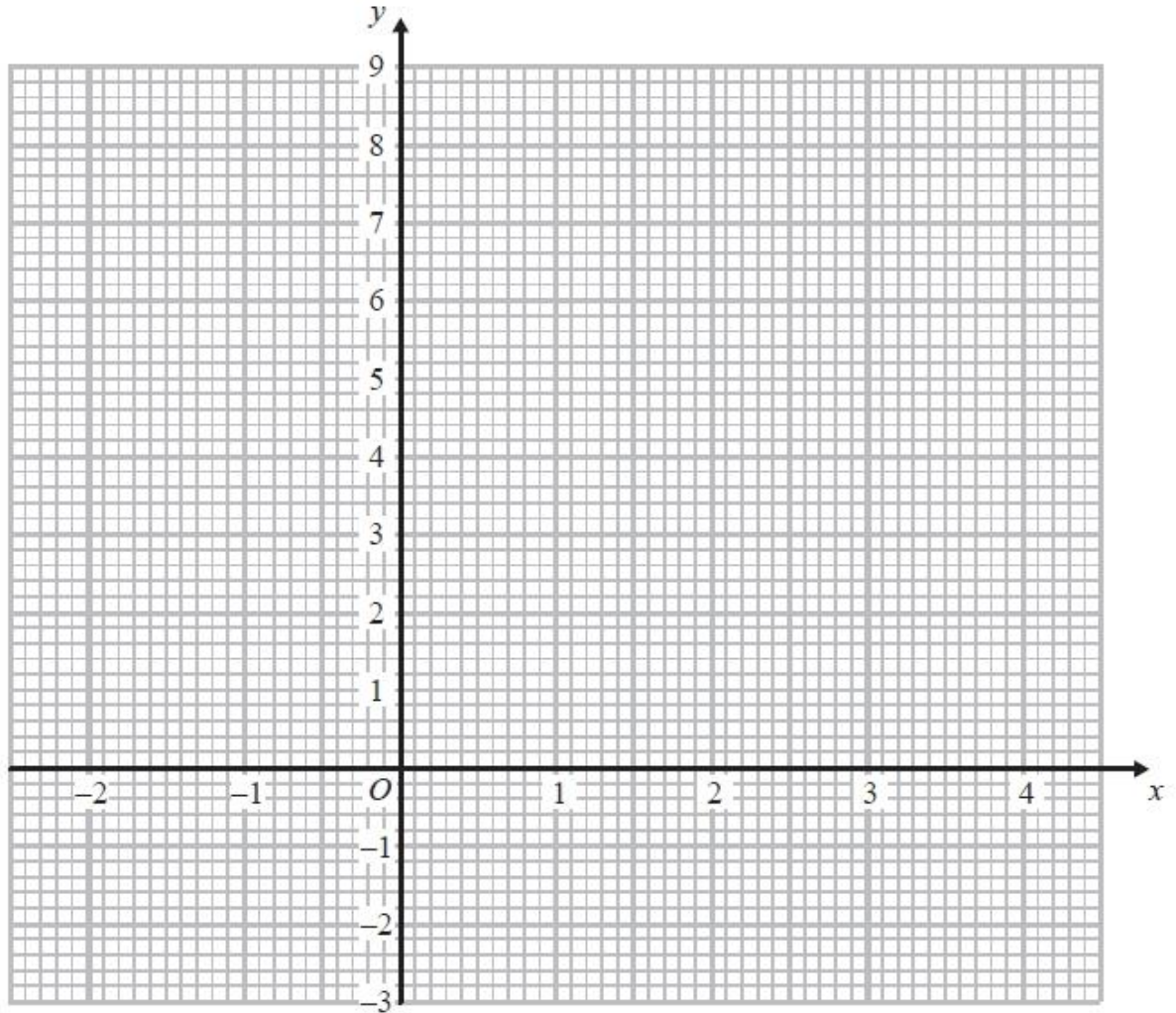
(Total for Question is 3 marks)

2. (a) Complete the table of values for $y = x^2 - 2x - 1$

| | | | | | | | |
|---|----|----|---|----|----|---|---|
| x | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y | 7 | | | -2 | -1 | | |

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 1$ for values of x from -2 to 4



(2)

(c) Solve $x^2 - 2x - 1 = x + 3$

(2)

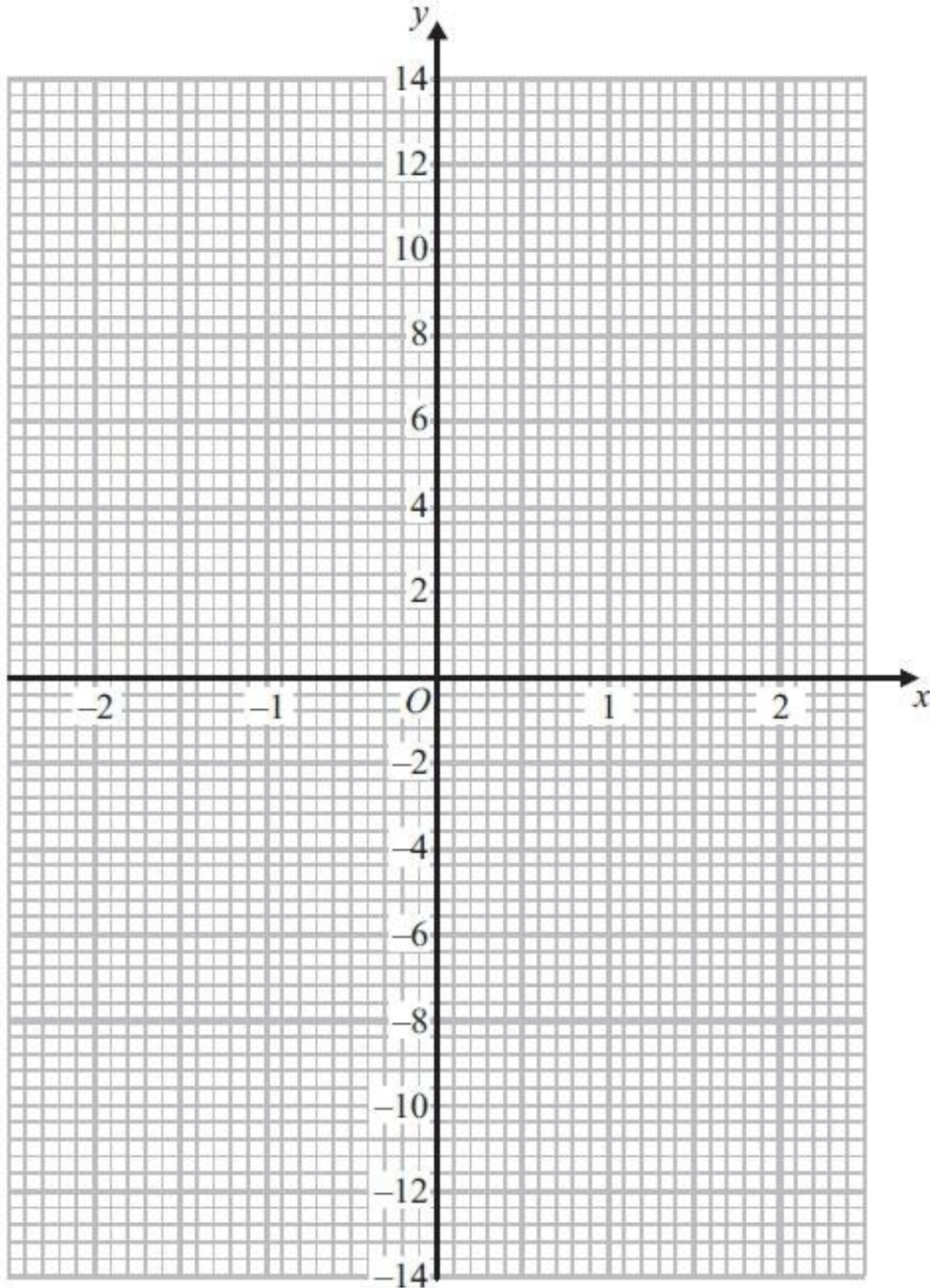
.....
(Total for Question is 6 marks)

3. (a) Complete this table of values for $y = x^3 + 2x - 1$

| | | | | | |
|---|----|----|---|---|----|
| x | -2 | -1 | 0 | 1 | 2 |
| y | | -4 | | | 11 |

(b) On the grid, draw the graph of $y = x^3 + 2x - 1$

(2)



(2)

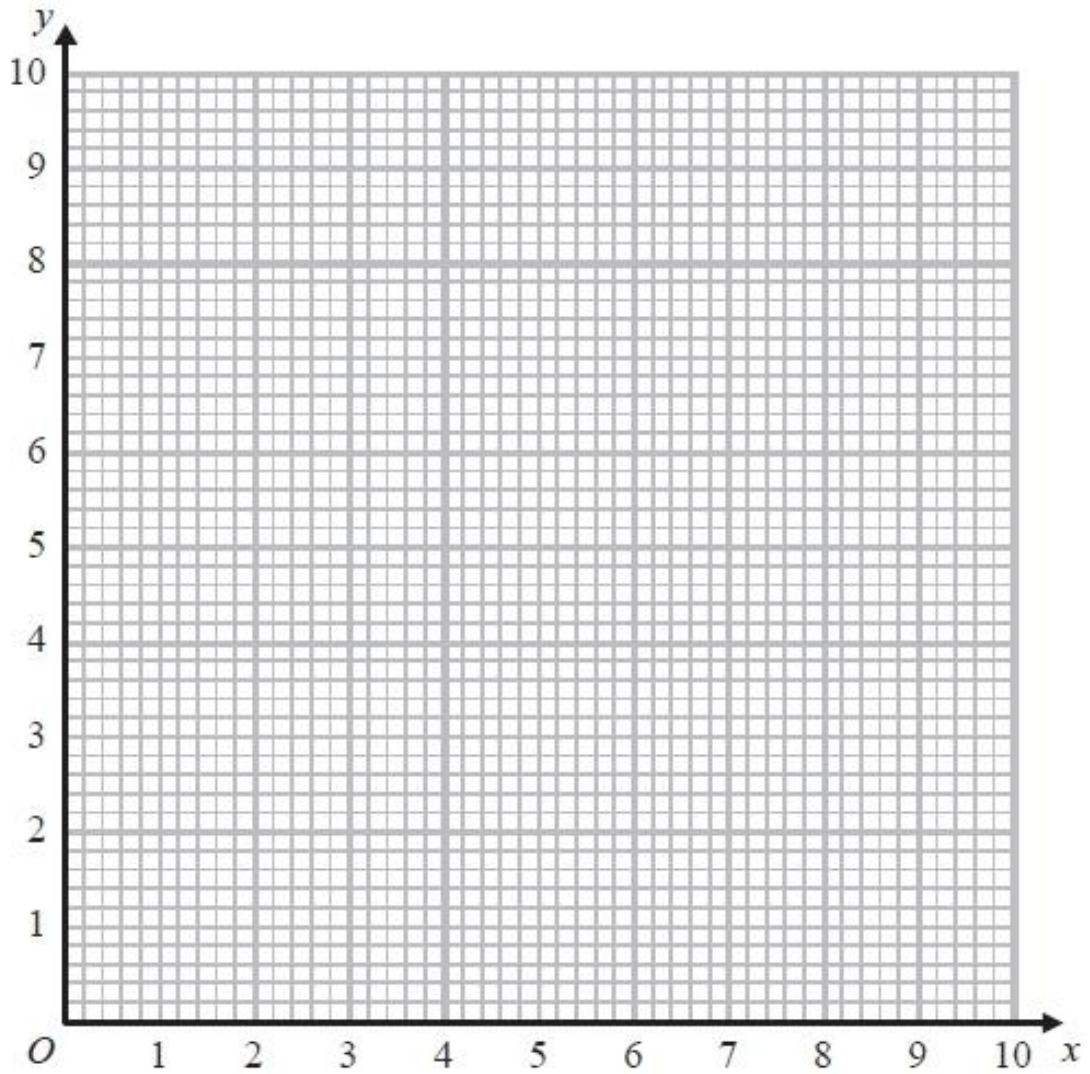
(Total for Question is 4 marks)

4. (a) Complete the table of values for $y = \frac{4}{x}$

| | | | | | | |
|---|-----|---|---|---|---|---|
| x | 0.5 | 1 | 2 | 4 | 5 | 8 |
| y | | | | | | |

(2)

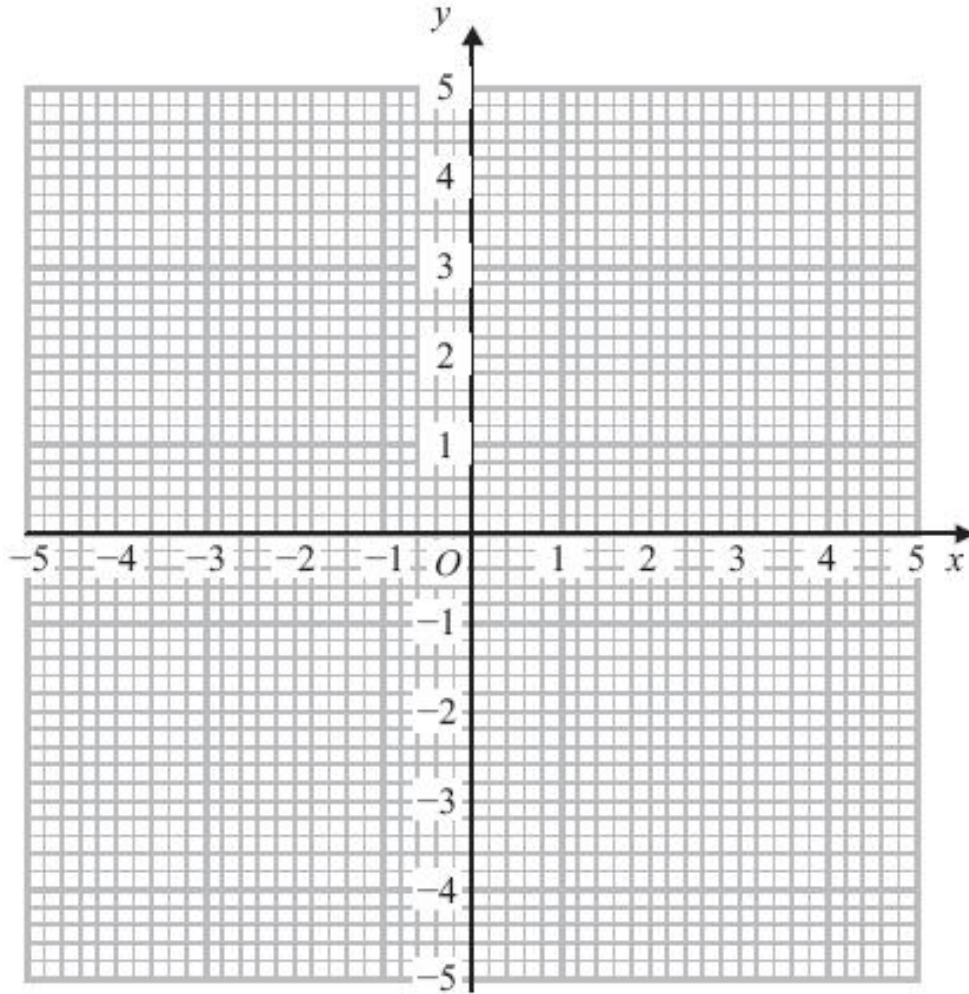
(b) On the grid, draw the graph of $y = \frac{4}{x}$ for $0.5 \leq x \leq 8$



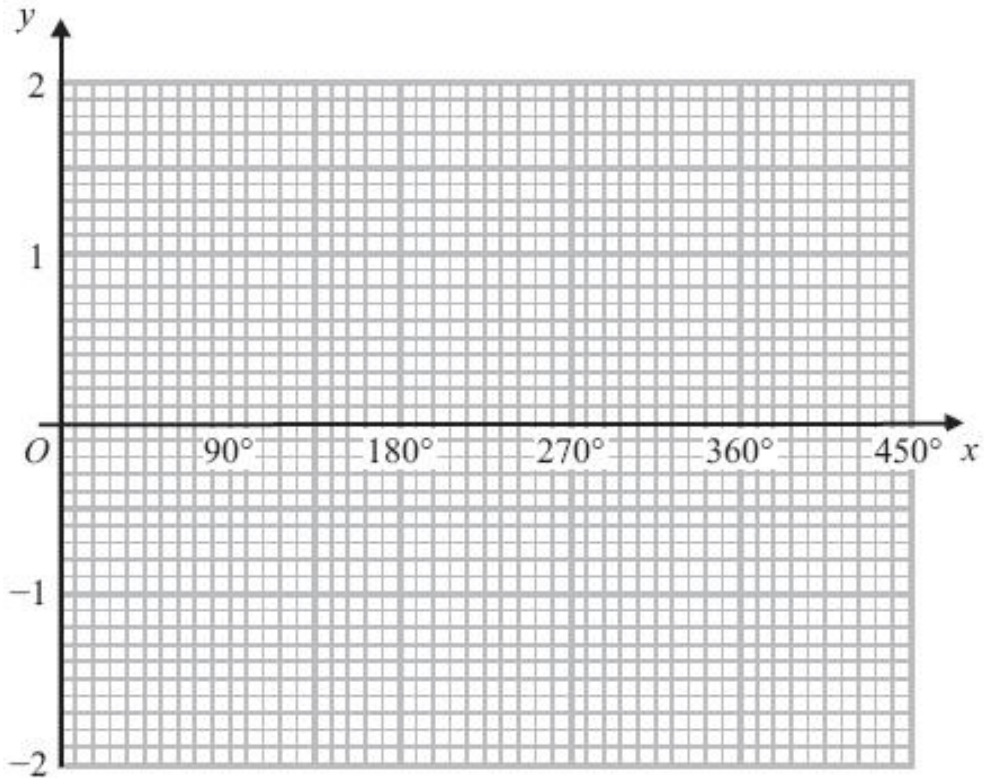
(2)

(Total for Question is 4 marks)

5. (a) On the grid, draw the graph of $x^2 + y^2 = 4$



- (b) On the grid, sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$



(2)

(2)

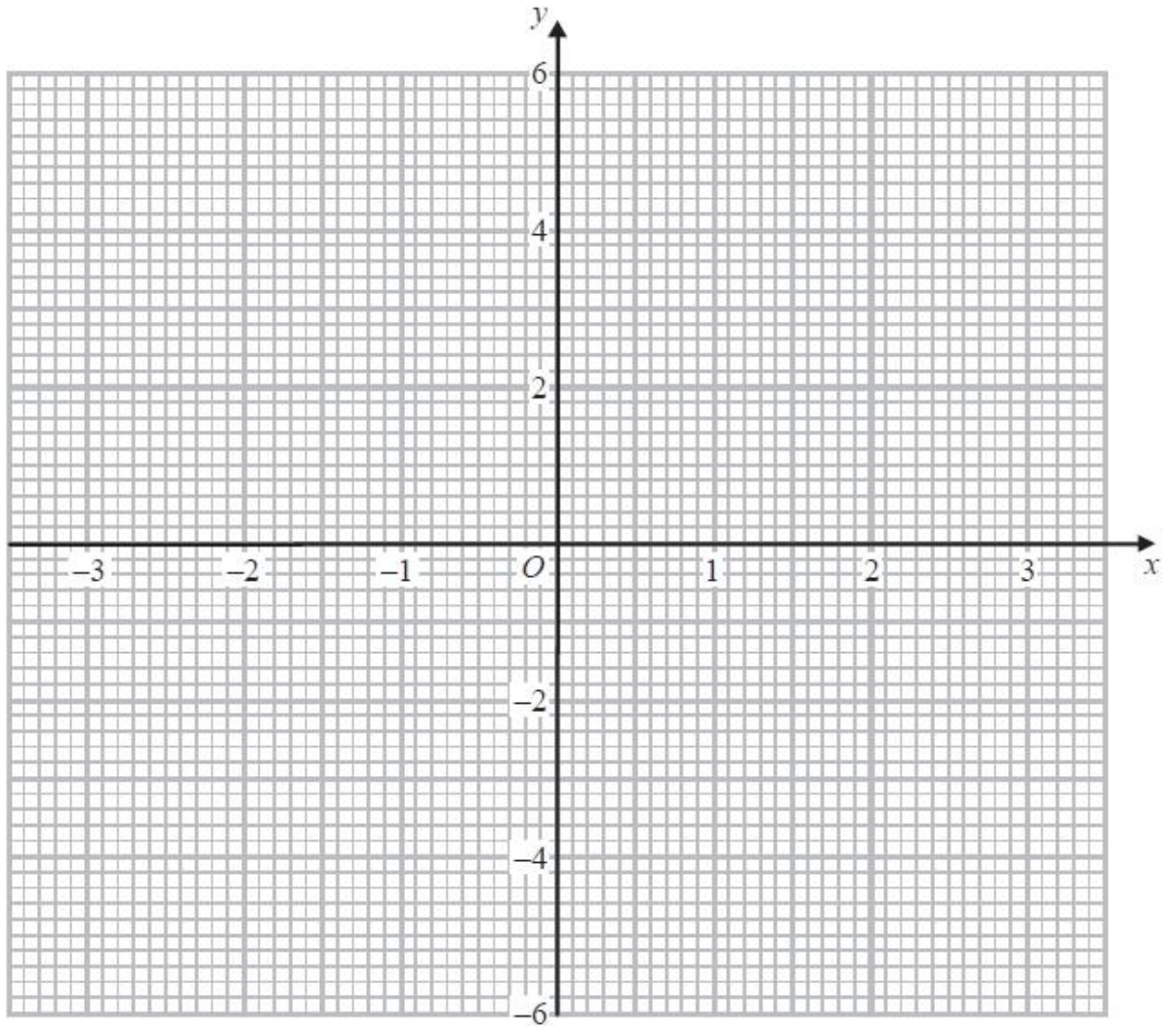
(Total for Question is 4 marks)

6. (a) Complete the table of values for $y = 4 - x^2$

| | | | | | | | |
|---|----|----|----|---|---|---|---|
| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| y | -5 | | 3 | | | 0 | |

(2)

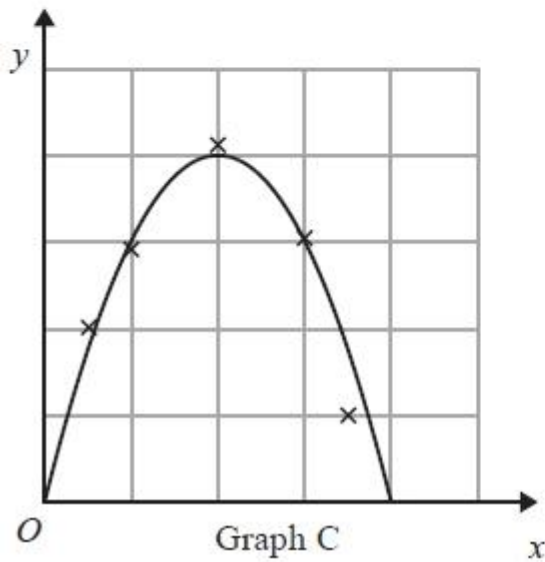
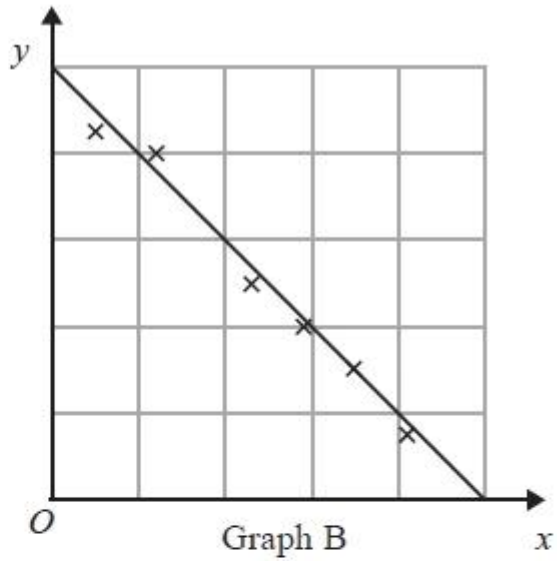
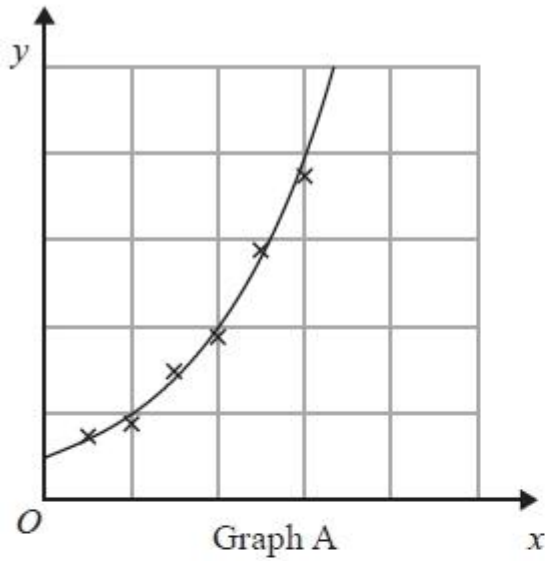
(b) On the grid, draw the graph of $y = 4 - x^2$ for values of x from -3 to 3



(2)

(Total for question = 4 marks)

7. Here are some graphs that show relationships.
A curve or line of best fit has been drawn on each graph.



The equation of each graph is one of the equations in the following list.

$y = 10 - 2x$ $y = 2^x$ $y = 2x - 10$ $y = 8x - 2x^2$ $y = 3x^2$

Give the equation of each graph.

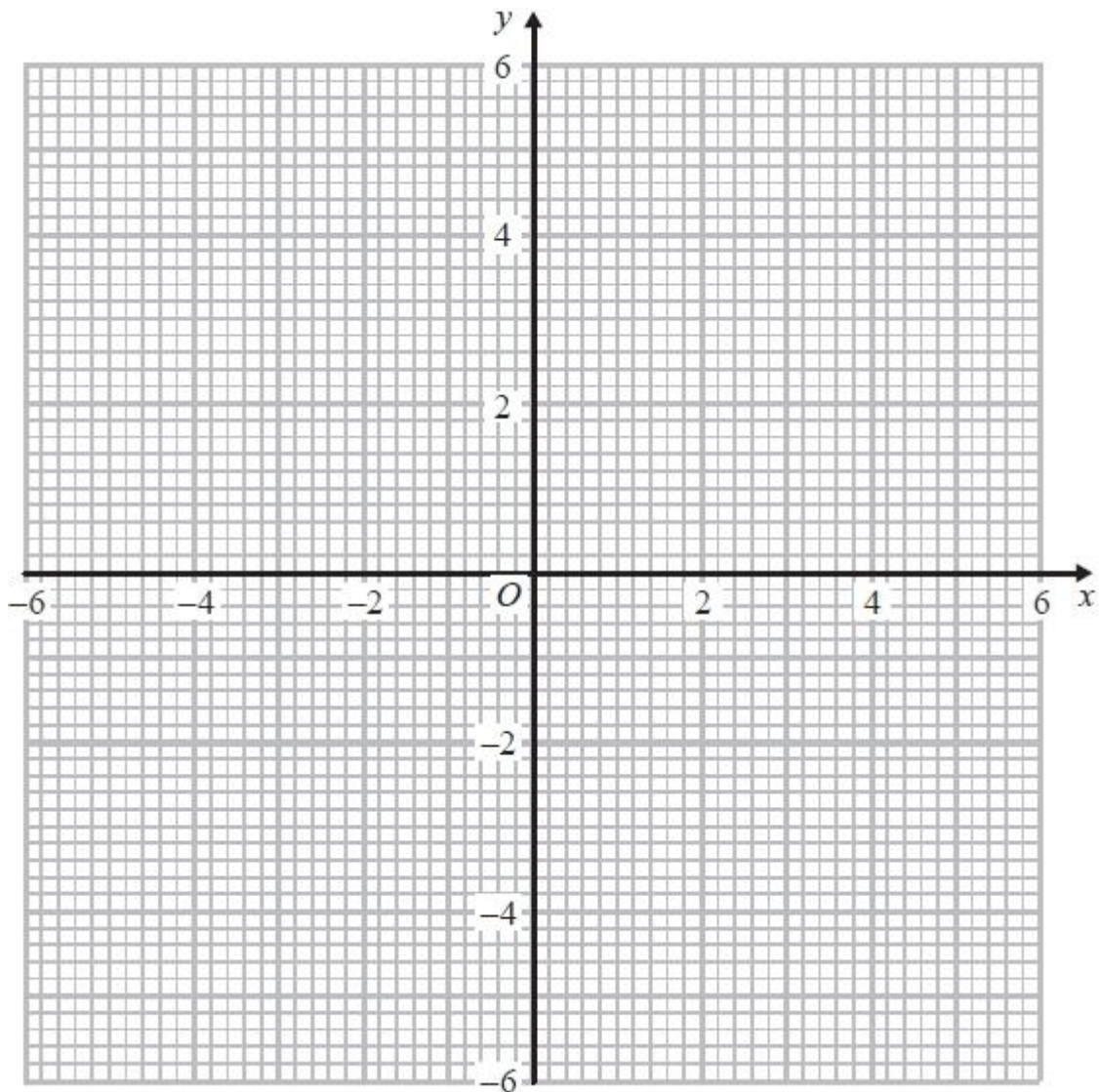
Graph A

Graph B

Graph C

(Total for question = 3 marks)

8. (a) On the grid, construct the graph of $x^2 + y^2 = 16$



(2)

- (b) Find estimates for the solutions of the simultaneous equations

$$\begin{aligned}x^2 + y^2 &= 16 \\ y &= 2x + 1\end{aligned}$$

.....
(3)

(Total for question = 5 marks)

Quadratic n^{th} Term and Other Sequences

Things to remember:

- The Fibonacci sequence is a set of numbers that starts with a one or a zero, followed by a one, and proceeds based on the rule that each number (called a Fibonacci number) is equal to the sum of the preceding two numbers.
- To find the n^{th} term of a quadratic sequence:
 - 1) Calculate the first difference.
 - 2) Calculate the second difference.
 - 3) Divide the second difference by 2 to find the coefficient of n^2 .
 - 4) Subtract an^2 from the original sequence.
 - 5) Calculate the n^{th} term of the difference.
 - 6) Write the quadratic n^{th} term.

Questions:

1. Here are the first 5 terms of a quadratic sequence.

1 3 7 13 21

Find an expression, in terms of n , for the n^{th} term of this quadratic sequence.

.....
(Total for question is 3 marks)

2. Here are the first five terms of an arithmetic sequence.

1 5 9 13 17

- (a) Write down an expression, in terms of n , for the n^{th} term of this sequence.

.....
(2)

The n^{th} term of a different number sequence is $3n^2 + 7$

- (b) Find the 10th term of this sequence.

.....
(2)
(Total for Question is 4 marks)

3. Here are the first six terms of a Fibonacci sequence.

1 1 2 3 5 8

The rule to continue a Fibonacci sequence is,
the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

..... (1)

The first three terms of a different Fibonacci sequence are

a b $a + b$

(b) Show that the 6th term of this sequence is $3a + 5b$

(2)

Given that the 3rd term is 7 and the 6th term is 29,

(c) find the value of a and the value of b .

$a =$

$b =$

(3)

(Total for question = 6 marks)

