Graphs of equations and functions – 2021/20 GCSE Mathematics Higher

1. Nov/2021/Paper_J560/04/No.14

Find the coordinates of the turning point of the graph of $y = x^2 + 6x + 17$.

(..... , ...) **[4]**

2. Nov/2021/Paper_J560/04/No.18

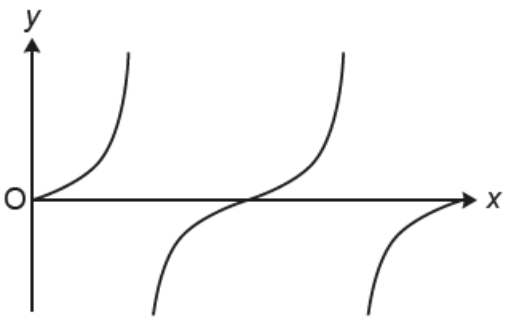
(a) For each graph below, select its possible equation from this list.

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

$y = \sin x$ $\quad$ $y = \cos x$ $\quad$ $y = \tan x$

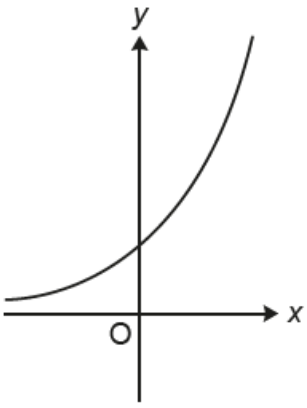
$y = 3^x$ $\quad$ $y = \left(\frac{1}{3}\right)^x$

(i)



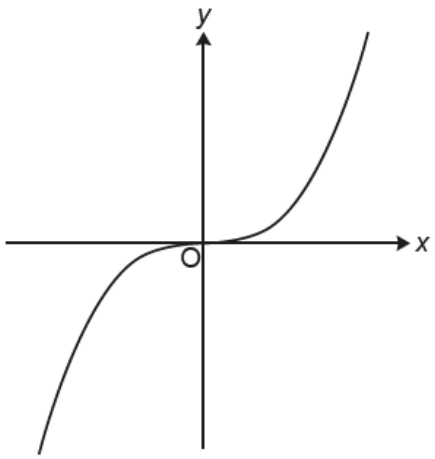
(a)(i) $y =$ ..... **[1]**

(ii)



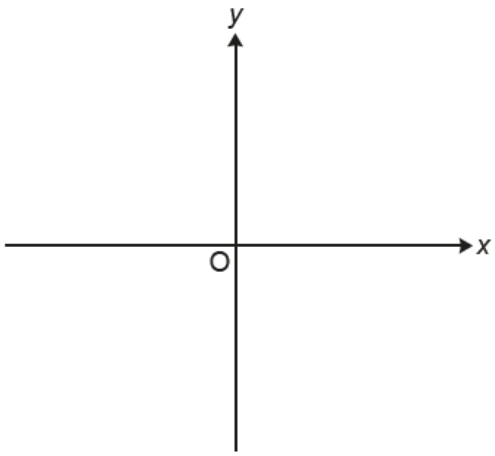
(ii) $y =$ ..... **[1]**

(b) Here is a sketch of $y = x^3$.



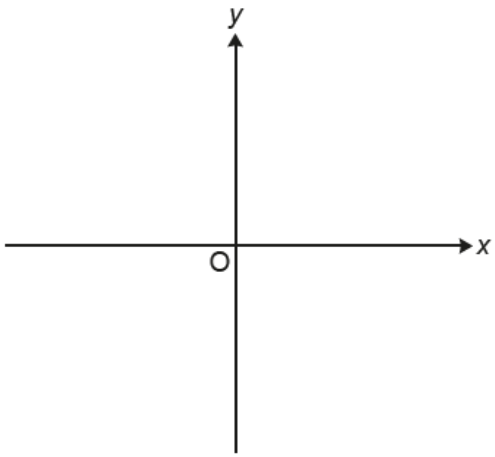
On the axes below, sketch the graphs of

(i) $y = -x^3$



[1]

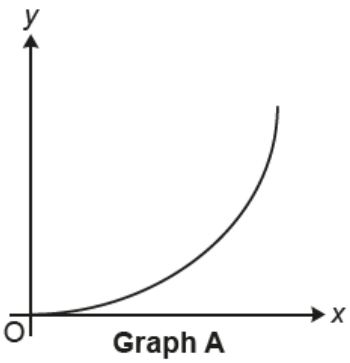
(ii) $y = x^3 - 8$, showing the values of any intercepts with the axes.



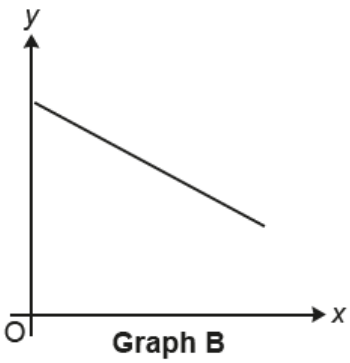
[3]

3. Nov/2021/Paper_J560/05/No.6

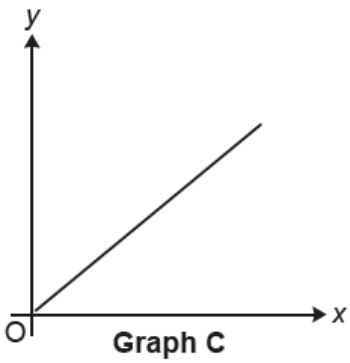
Here are sketches of five graphs.



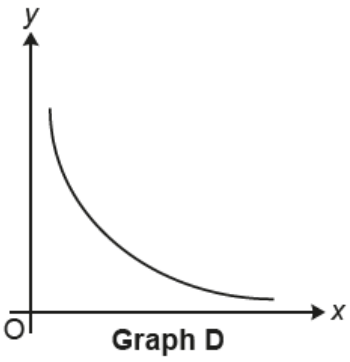
Graph A



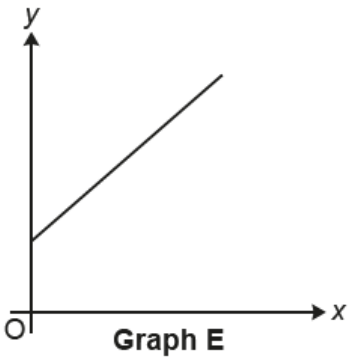
Graph B



Graph C



Graph D



Graph E

Write the letter of the graph that represents the following relationships.

(a) y is directly proportional to x.

(a) ..... **[1]**

(b) y is inversely proportional to x.

(b) ..... **[1]**

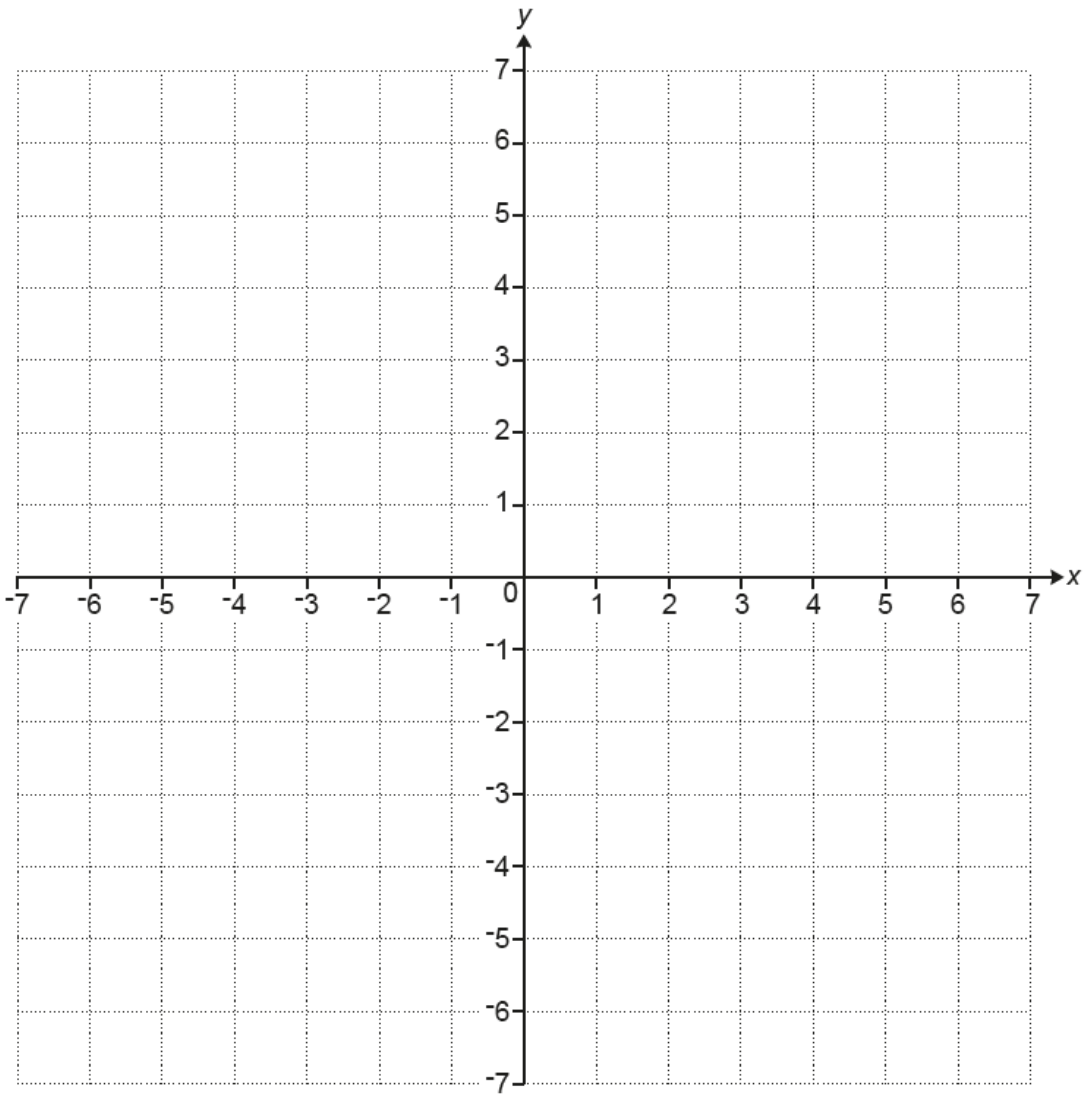
4. Nov/2021/Paper_J560/05/No.8

(a) Complete the table for $y = \frac{6}{x}$.

x	-6	-3	-2	-1	1	2	3	6
y	-1	-2		-6	6	3	2	1

[1]

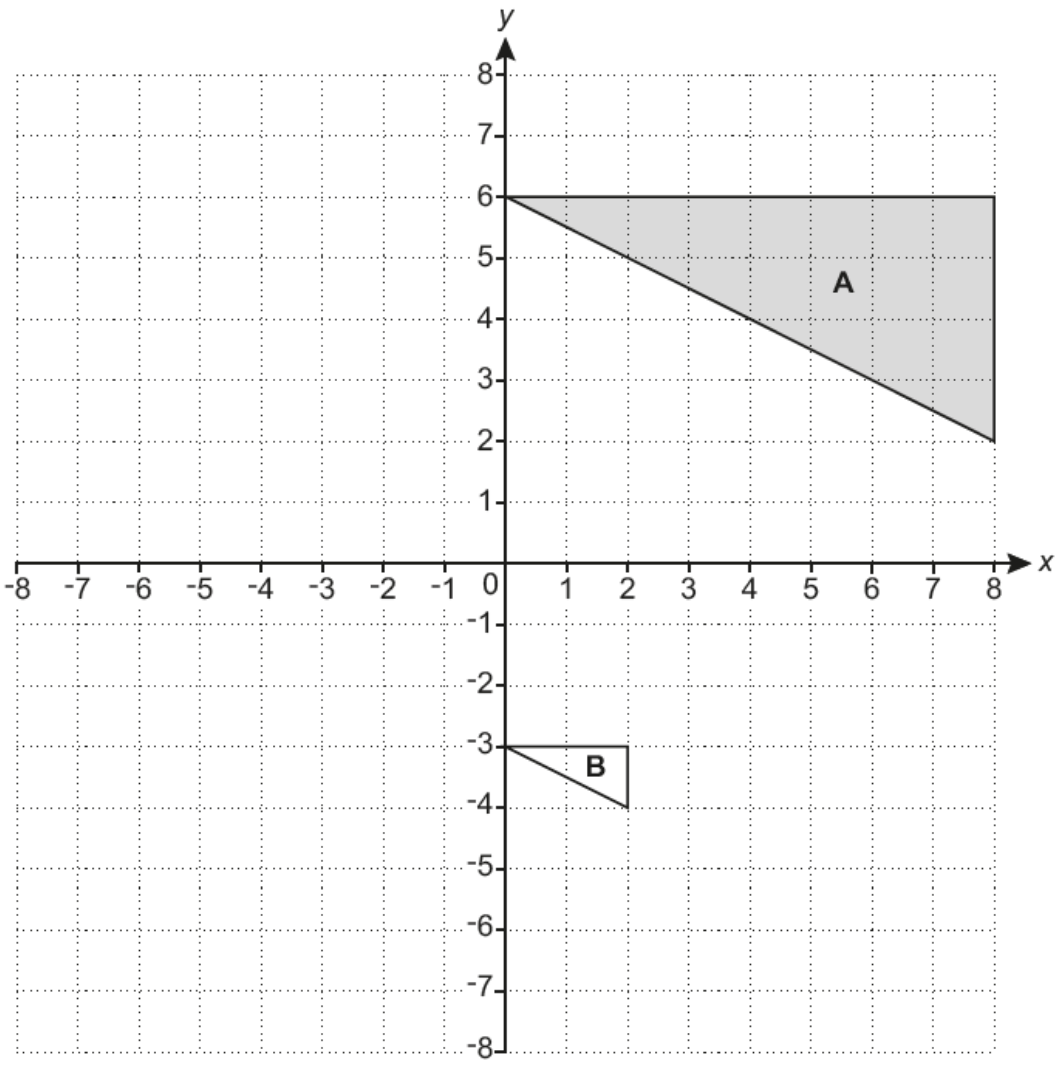
(b) Draw the graph of $y = \frac{6}{x}$ for $-6 \leqslant x \leqslant 6$, $x \neq 0$.



[3]

5. Nov/2021/Paper_J560/06/No.4

Triangle **A** and triangle **B** are drawn on the coordinate grid.



(a) Reflect triangle **A** in the line $x = 0$. **[2]**

(b) Describe fully the **single** transformation that maps triangle **A** onto triangle **B**.

.....

..... **[3]**

6. Nov/2021/Paper_J560/06/No.13

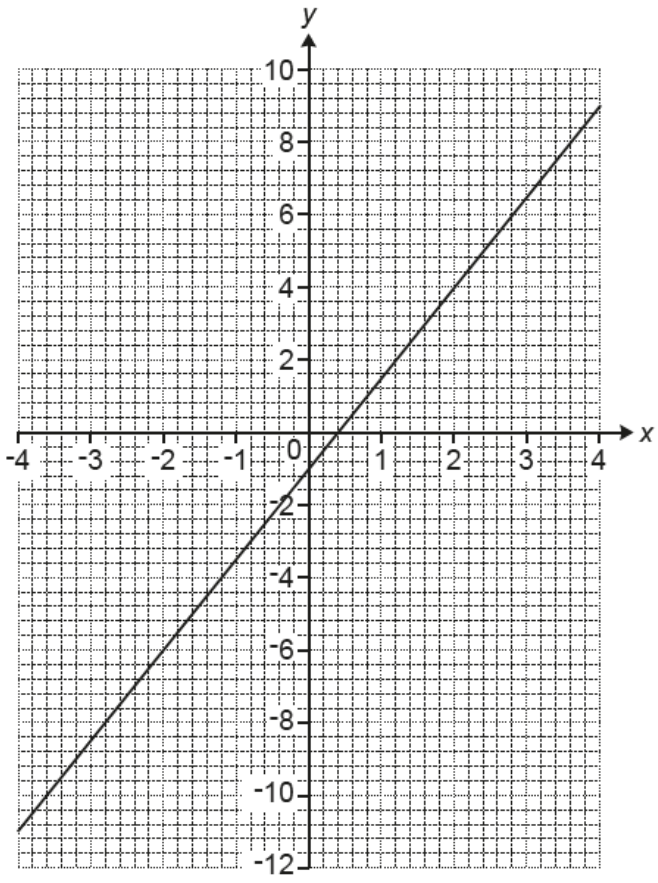
A straight line passes through the point (8, 1) and is perpendicular to the line $y = 4x - 2$.

Find the equation of the line, giving your answer in the form $y = mx + c$.

..... **[4]**

7. Nov/2020/Paper_J560/04/No.7

This graph shows part of a straight line.



(a) Show that the gradient of the line is 2.5. **[1]**

(b) Write down the equation of the line.

(b) ..... **[2]**

8. Nov/2020/Paper_J560/04/No.8

Lily buys and sells microwaves.

She buys each one for £32 and sells it for £60.
She also pays £7 for the delivery of each microwave she sells.

If she sells a microwave that is faulty then Lily must pay for its repair and redelivery.
This costs her another £25 for each faulty microwave.

Last month, 6 out of the 80 microwaves Lily sold were faulty.

This month she has orders for 133 microwaves.

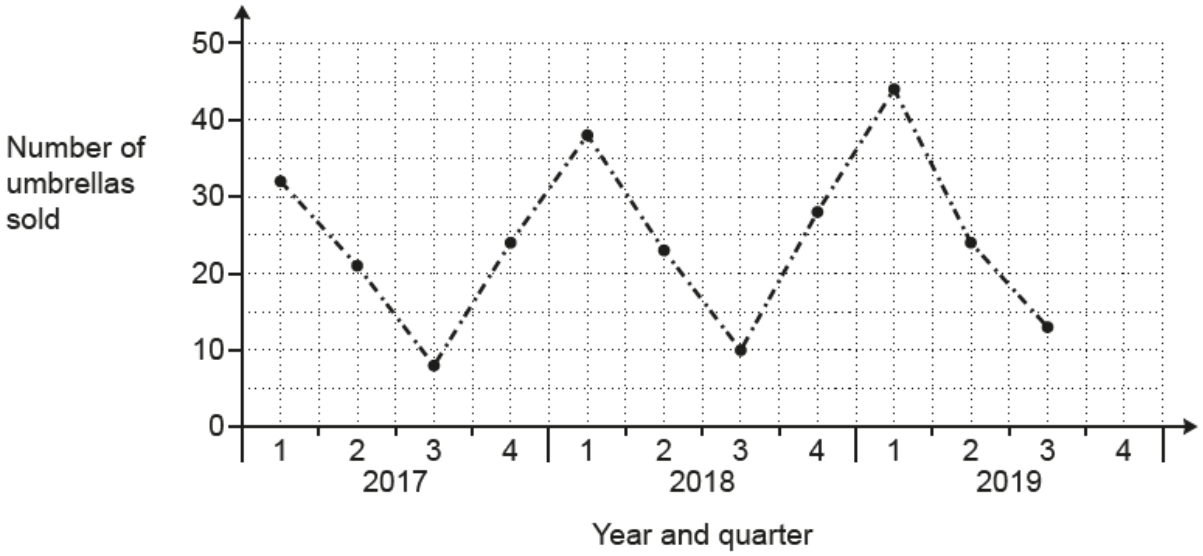
Calculate her expected percentage profit on this month's order.
Showing your working in the boxes below may help you present your work.

Expected number of faulty microwaves:	Expected costs:
Income from sales:	Expected percentage profit:

..... % **[6]**

9. Nov/2020/Paper_J560/04/No.9

The graph shows the number of umbrellas sold in Ling's shop for each quarter from quarter 1 of 2017 to quarter 3 of 2019.



(a) The shop sold 32 umbrellas in quarter 4 of 2019.

Complete the graph. **[1]**

(b) Make one comment about the **seasonal** variation shown in this graph.

.....

..... **[1]**

(c) Make one comment about the **annual** variation shown in this graph.

.....

..... **[1]**

(d) Ling predicts that she will sell 50 umbrellas in quarter 1 of 2020.

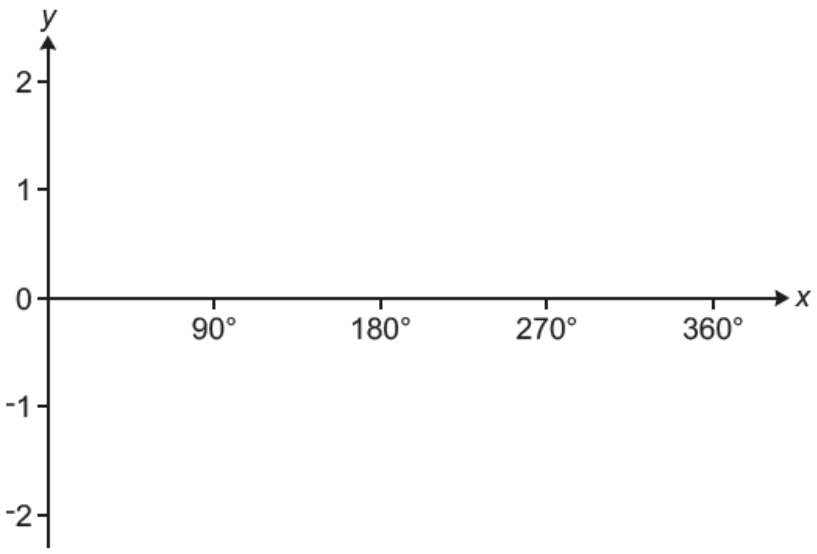
What assumption has she made?

.....

..... **[1]**

10. Nov/2020/Paper_J560/05/No.13

(a) Sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



[2]

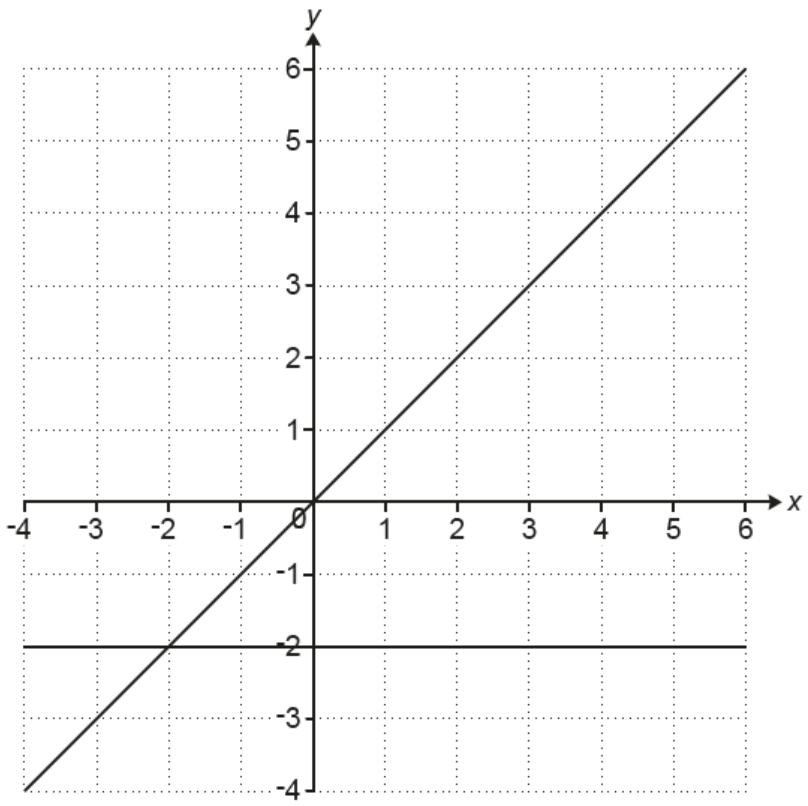
(b) The graph of $y = \cos(x - 30)$ for $0° \leqslant x \leqslant 360°$ crosses the x-axis in two places.

Write down the values of x where this occurs.

$x =$ ..... and ..... **[2]**

11. Nov/2020/Paper_J560/05/No.17

The graphs of $y = x$ and $y = -2$ are drawn on the grid.



The region R satisfies the following inequalities.

$y \geqslant -2$ $\quad y \leqslant x$ $\quad y < 4 - 2x$

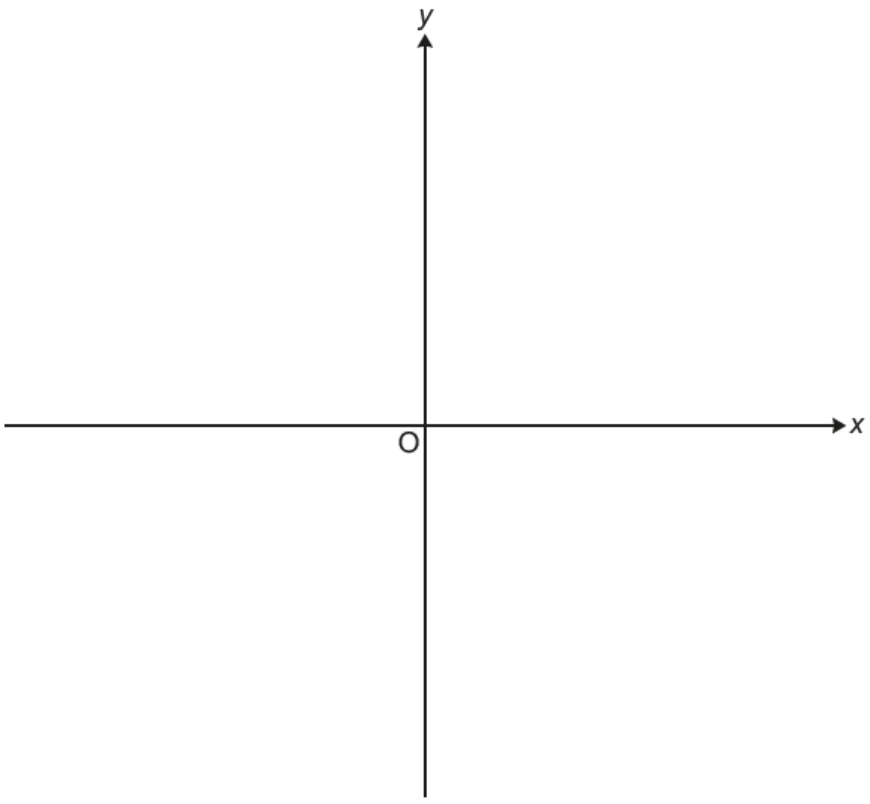
By drawing one more line, find and label the region R. **[5]**

12. Nov/2020/Paper_J560/05/No.19

(a) Write $x^2 - 10x + 22$ in the form $(x-a)^2 - b$.

(a) ..... **[3]**

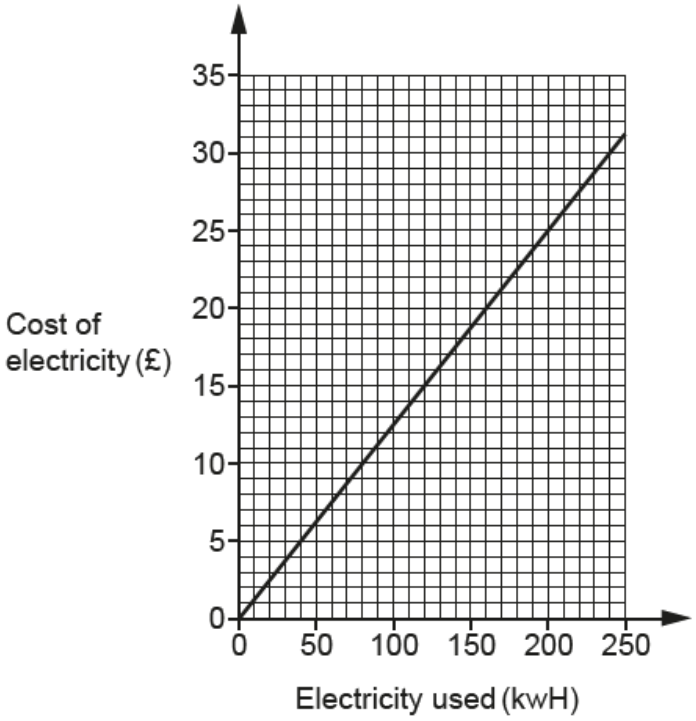
(b) Sketch the graph of $y = x^2 - 10x + 22$.
Show clearly the coordinates of any turning points and the value of the y-intercept.



[4]

13. Nov/2020/Paper_J560/06/No.3

The graph shows the cost of electricity with Company A.



(a) Use the information in the graph to estimate the cost of electricity for a customer who uses 450 kwH of electricity.

(a) £ ..... **[3]**

(b) Company B charges 14.3 pence per kwH of electricity used.

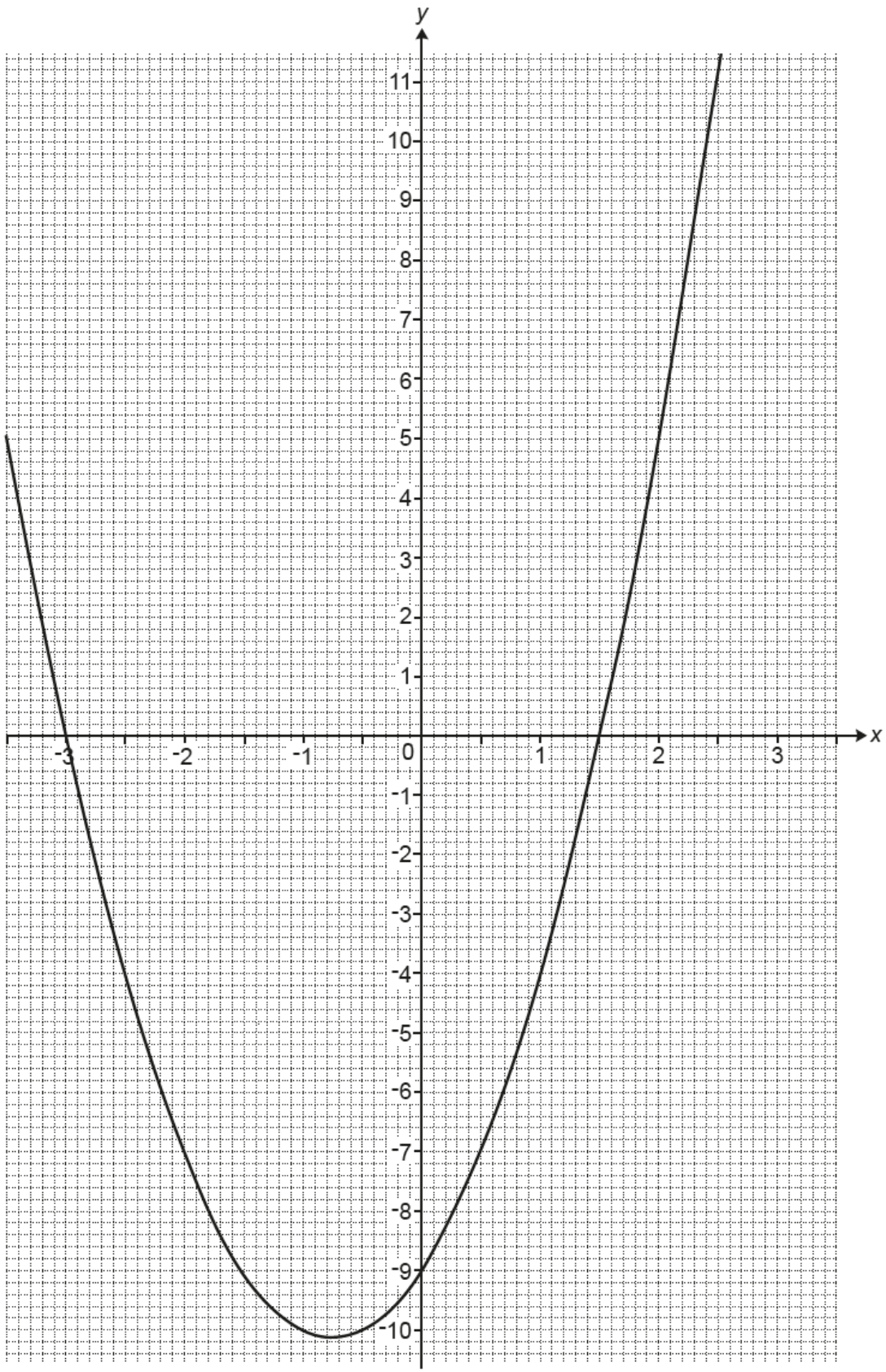
If Company B's cost of electricity was plotted on the same axes as Company A's cost of electricity, which line would be steeper?
Explain how you know.

Company ..... would have the steeper line because .....

.....

..... **[3]**

The graph of $y = 2x^2 + 3x - 9$ is drawn below.



(a) Use the graph to solve $2x^2 + 3x - 9 = 0$.

(a) $x =$ ..... or $x =$ ..... **[2]**

(b) The equation $2x^2 + x - 4 = 0$ can be solved by finding the intersection of the graph of $y = 2x^2 + 3x - 9$ and the line $y = ax + b$.

(i) Find the value of a and the value of b.

(b)(i) $a =$ .....

$b =$ ..... **[2]**

(ii) Hence **use the graph** to solve the equation $2x^2 + x - 4 = 0$.

(ii) $x =$ ..... or $x =$ ..... **[3]**