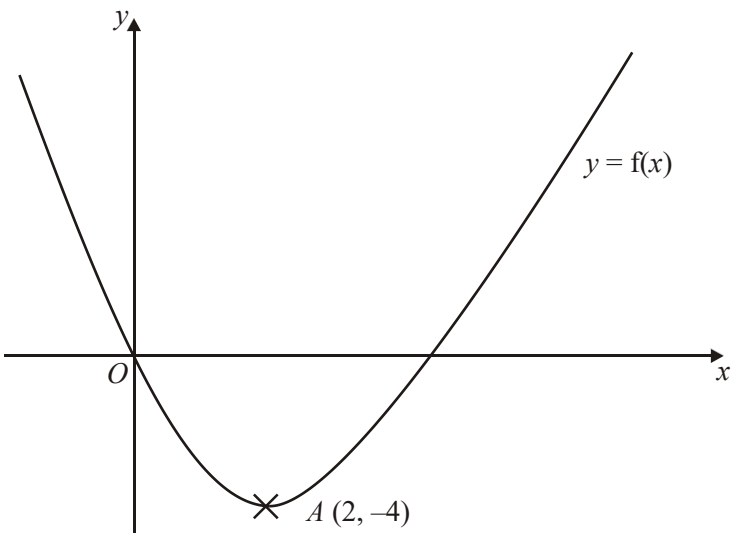
1. This is a sketch of the curve with equation $y = f(x)$.
It passes through the origin O.



The only vertex of the curve is at A (2, –4)

(a) Write down the coordinates of the vertex of the curve with equation

(i) $y = f(x - 3)$, (..... , ...)

(ii) $y = f(x) - 5$, (..... , ...)

(iii) $y = -f(x)$, (..... , ...)

(iv) $y = f(2x)$. (..... , ...)

(4)

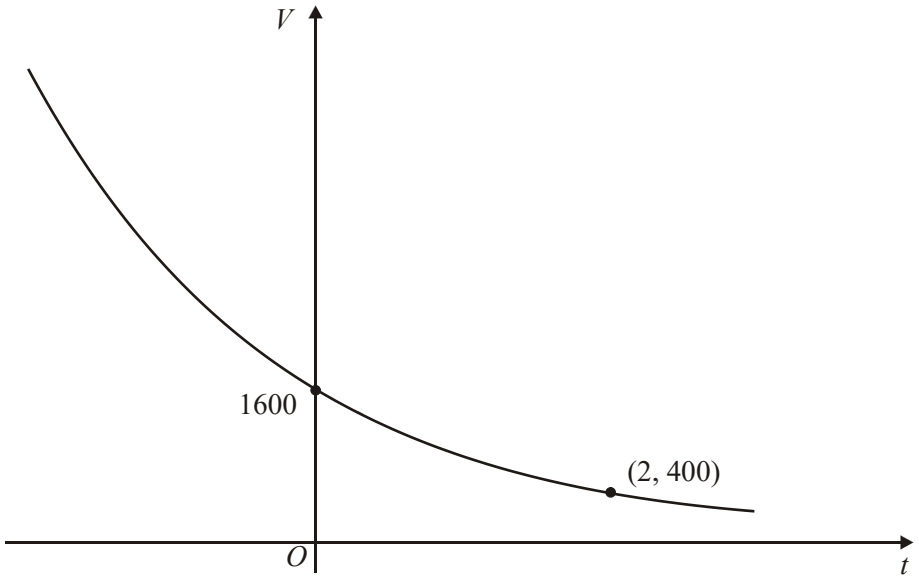
The curve with equation $y = x^2$ has been translated to give the curve $y = f(x)$.

(b) Find $f(x)$ in terms of x.

$f(x) =$ .....

(4)
(Total 8 marks)

2. Mr Patel has a car.



The value of the car on January 1st 2000 was £1600
The value of the car on January 1st 2002 was £400

The sketch graph shows how the value, £V, of the car changes with time.
The equation of the sketch graph is

$$V = pq^t$$

where t is the number of years after January 1st 2000.
p and q are positive constants.

(a) Use the information on the graph to find the value of p and the value of q.

p = ... q = ...

(3)

(b) Using your values of p and q in the formula $V = pq^t$ find the value of the car on January 1st 1998.

£ .....

(2)
(Total 5 marks)

3.

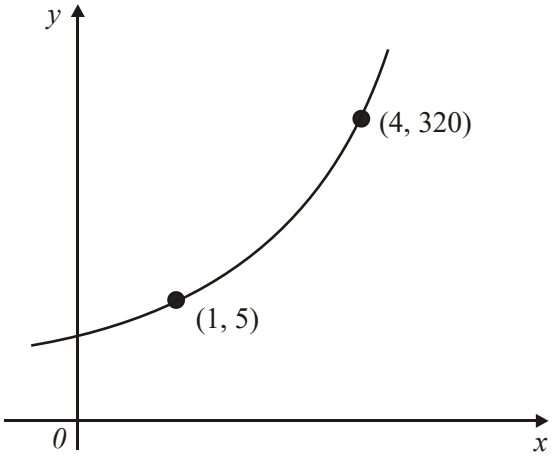


Diagram **NOT** accurately drawn

The sketch graph shows a curve with equation $y = pq^x$

The curve passes through the points (1, 5) and (4, 320).

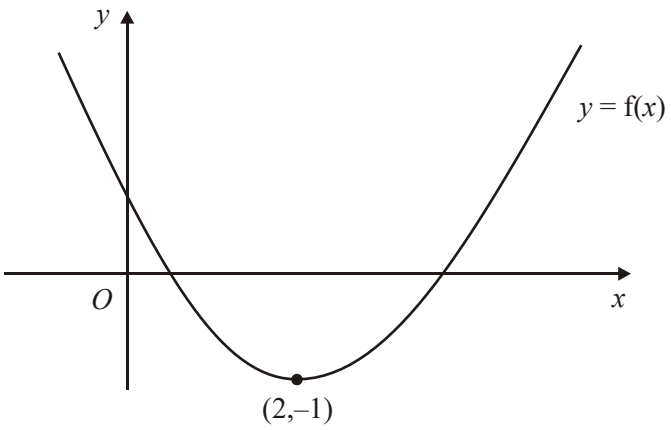
Calculate the value of p and the value of q.

p = ...

q = ...

(Total 3 marks)

4.



The diagram shows part of the curve with equation $y = f(x)$
The minimum point of the curve is at (2, –1)

(a) Write down the coordinates of the minimum point of the curve with equation

(i) $y = f(x + 2)$

.....

(ii) $y = 3f(x)$

.....

(iii) $y = f(2x)$

.....

(3)

The curve $y = f(x)$ is reflected in the y axis.

(b) Find the equation of the curve following this transformation.

$y =$ .....

(1)

The curve with equation $y = f(x)$ has been transformed to give the curve with equation $y = f(x) + 2$

(c) Describe the transformation.

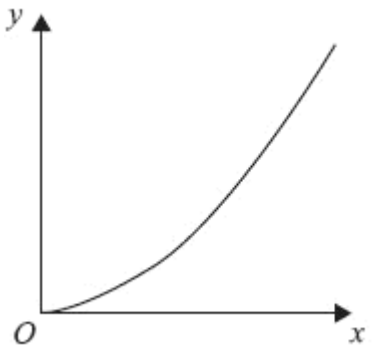
.....

(1)

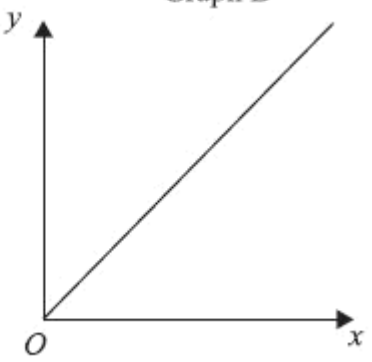
(Total 5 marks)

5.

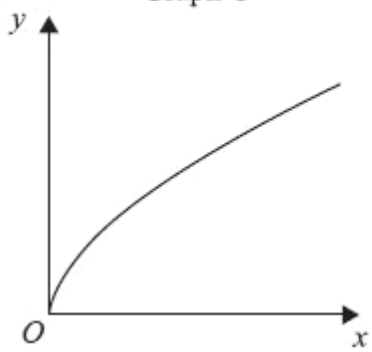
Graph A



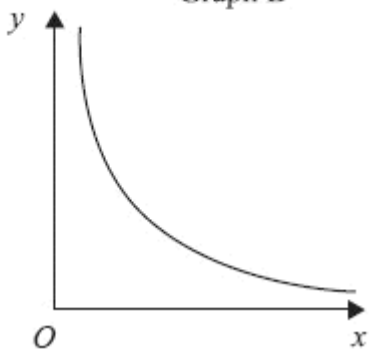
Graph B



Graph C



Graph D



For $k > 0$ each graph matches with one of the equations,

$y = kx$ $\quad y = k\sqrt{x}$ $\quad y = \frac{k}{x}$ $\quad y = kx^2$

Match each graph to its equation,

Equation	Graph
$y = kx$	
$y = k\sqrt{x}$	
$y = \frac{k}{x}$	
$y = kx^2$	

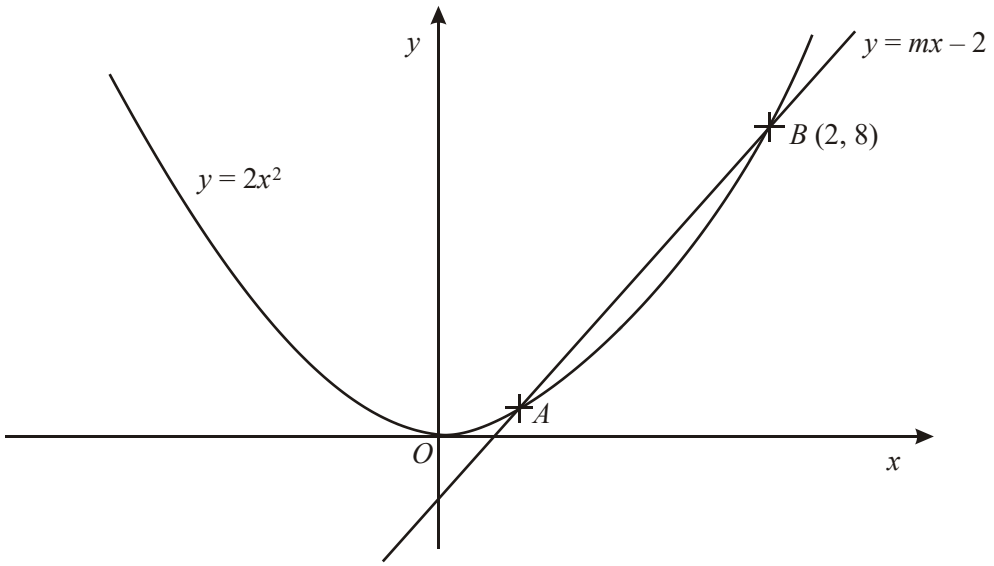
(Total 3 marks)

6. (a) Find the equation of the straight line which passes through the point (0, 3) and is perpendicular to the straight line with equation $y = 2x$.

.....

(2)

The graphs of $y = 2x^2$ and $y = mx - 2$ intersect at the points A and B. The point B has coordinates (2, 8).



(b) Find the coordinates of the point A.

(....., ...)

(Total 4 marks)

1. (a) (i) (5, – 4) 4

B1 cao

(ii) (2, – 9)

B1 cao

(iii) (2, 4)

B1 cao

(iv) (1, – 4)

B1 cao

(b) $(x – 2)^2 – 4$ 4

B4 for $(x – 2)^2 – 4$ oe eg. $x^2 – 4x$
(B3 for $(x + 2)^2 – 4$ or $(x – 2)^2 + 4$)
(B2 for $x^2 – 4$ or $(x – 2)^2$ OR $x^2 + bx$, $b \neq 0$
OR $(x + 2)^2 + 4$ OR f $(x – 2) – 4$)
(B1 for $x^2 + 4$ or $(x + 2)^2$ or $ax^2 + bx$ or $x^2 + bx + c$
OR $x – 2 – 4$ or $x^2 – 2 – 4$, a, b, $c \neq 0$)

[8]

2. (a) $1600 = p\ q^0$.; $400 = pq^2$ $p = 1600$
$q^2 = 0.25$ $q = 0.5$ 3

M1 for either $400 = pq^2$ or $1600 = pq^0$
B1 for p = 1600
A1 for q = 0.5

(b) $V = pq^{-2}$ 6400 2

M1 for recognition that t = –2
A1 for 6 400

[5]

3. (1,5) on curve so $pq^1 = 5$
(4,320) on curve so $pq^4 = 320$
$pq^4 = pq\,(q^3) = 5q^3 = 320$ so $q^3 = 64$
$q = \sqrt[3]{64} = 4$ and $p = \frac{5}{q} = \frac{5}{4}$
$p = 1.25$
$q = 4$ 3

B1 for pq = 5
B1 for $pq^4 = 320$
B1 cao for both p = 1.25 oe and q = 4
(B3 for correct answer with no working)

[3]

4. (a) (i) (0,–1) 3

B1 cao

(ii) (2,–3)

B1 cao

(iii) (1,–1)

B1 cao

(b) *y = f (–x)* 1

B1 cao

(c) Translation by + 2 parallel to the *y*-axis 1

B1 for translation by $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$

[5]

5. (i) = B, (ii) = C, (iii) = D, (iv) = A 3

B3 for all correct
(B2 for 2 correct, B1 for 1 correct)

[3]

6. (a) $y = -0.5x + 3$ oe 2

B2 for $y = -0.5x + 3$ oe
*(B1 for $y = nx + 3$ oe **or** $y = -0.5x + a$ oe)*

(b) (0.5, 0.5) 4

$8 = 2m - 2$ ($m = 5$)
$2x^2 = 5x - 2$
$2x^2 - 5x + 2 = 0$
$(2x - 1)(x - 2) = 0$
$x = 2, 0.5$
$y = 5 \times 0.5 - 2$

M1 for $8 = 2m - 2$ OR $2x^2 = mx - 2$

M1 for $2x^2 =$ "5" $\times x - 2$ OR $y = 2 \times \left(\frac{y+2}{"5"}\right)^2$

A1 for $x = 0.5$
A1 for $y = 0.5$

[6]

1. Mathematics A Paper 5

It was not uncommon to see grade A and A* candidates picking up at least two marks in part (a) although (iv) was frequently incorrect. Part (b), as expected, proved to be a test even for the A* candidates although many such candidates were awarded partial credit. Those who had a thorough understanding of the topic had no problem writing down the answer.

Mathematics B Paper 18

The whole of this question was poorly answered. Those candidates who scored some marks in (a) were more successful in parts (ii) and (iii). Part (b) was very poorly answered with only a very few correct answers seen.

2. It was rare to find any candidate below a middle grade A gaining full marks in this question although many others obtained partial credit, normally for either forming one correct equation in p and q or spotting that $t = -2$ in part (b). The most common error was to interpret pq^t as $(pq)^t$ which frequently led to the wrong values 4 and 5 for p and q. Answers of less than £10 for the value of the car in 1998 within the context of the question did not seem to concern some candidates.

3. Many candidates were able to make a start on this question by writing $pq = 5$ and/or $pq^4 = 320$, but only the best candidates could solve these algebraically, substitution being the preferred approach.

4. **Specification A**

Many candidates were able to score at least one mark in part (a), and generally in (i). Part (ii) and (iii) were less well done. Common errors here were (i) (4, –1), (ii) (6, –3), (iii) (4, –1) or (2, –1) or (2, –2).
Just under a quarter of the candidates could write down the transformation in part (b), common errors were $y = -f(x)$ and, less frequently, $y = -f(-x)$.
In part (c), very few candidates could give a mathematically correct description of the transformation that involved the word translation, though it was clear in many cases that they knew what was required.

Specification B

Unsurprisingly, success in this question was limited to a small number of candidates. In part (a) 30% of candidates were able to give the correct coordinate in (i) with this falling to 20% in (ii) and 10% in (iii). The most common error in part (b) was to give the equation as $y = -f(x)$. In part (c) a number of candidates were able to describe what would happen to the curve, but only about 4% of all candidates were able to correctly define the transformation as a translation and provide enough detail to describe the translation accurately.

5. The majority of candidates were able to gain some credit in this question. The linear graph was most easily identified.

6. The most frequently seen answer for part (a) was $y = -2x + 3$. The majority of candidates recognised that a y intercept of +3 would give the constant term of +3 but few candidates were able to give the correct gradient. Few candidates were able to start part (b). A minority of candidates were able to get as far as $m = 5$ and then write $2x^2 = 5x - 2$ but were then unable to progress further.