Task 2

Question 1

g is the function $g(x) = x^2 - 25$

Find $g(-3)$.

$g(-3) =$ .....

(1 mark)

Question 2

The function f is defined as $f: x \to 2x^2 + 3x$

The function g is defined as $g: x \to 4 - \frac{x+7}{x+3}$

Find $fg(5)$

.....

(2 marks)

Question 3

The function f is such that $f(x) = 3x^2 - 12x + 7$ where $x \leq 2$

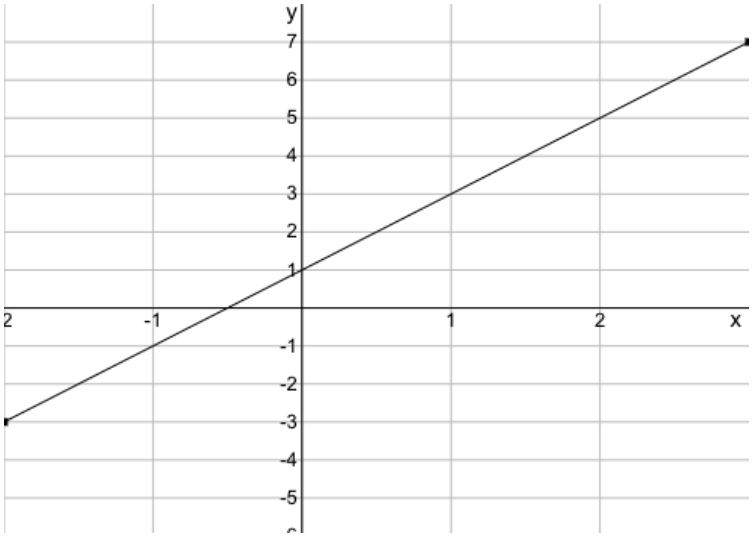
Express the inverse function f^{-1} in the form $f^{-1}(x) = \cdots$

$f^{-1}(x) =$ .....

(4 marks)

Question 4

The graph of $y = 2x + 1$ is drawn on the grid below.



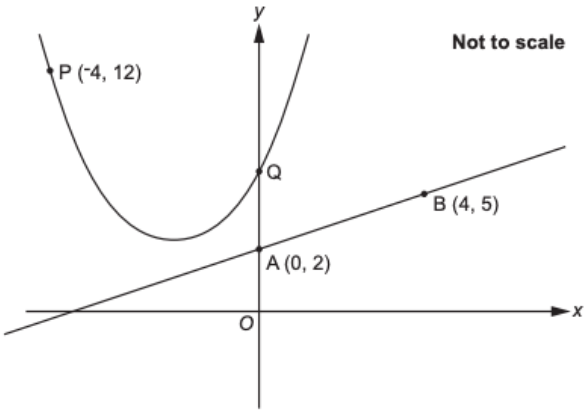
Use the graph to find the value of y when $x = -1.5$

$y =$ .....

(1 mark)

Question 5

The diagram shows a straight line that passes through points A and B, and a curve that passes through points P and Q.



The equation of the curve is $y = x^2 + kx + 8$.

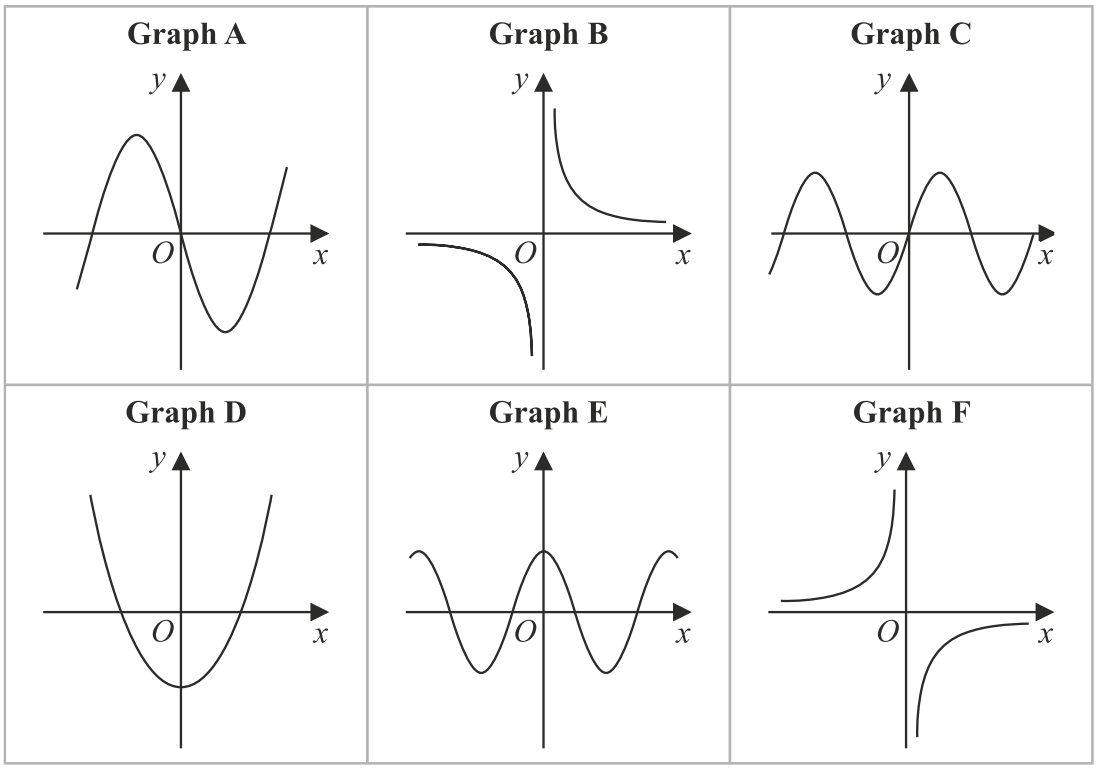
Find the value of k.

$k = \ldots\ldots\ldots$

(3 marks)

Question 6

Here are 6 graphs.



Complete the table below with the letter of the graph that could represent each given equation.

Equation	Graph
$y = \sin x$	
$y = -\frac{3}{x}$	
$y = 4x^3 - 5x$	

(3 marks)

Question 7

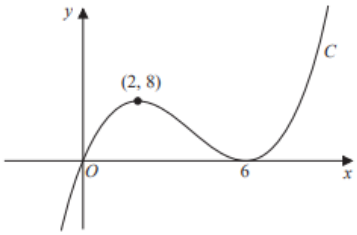


Figure 1

Figure 1 shows a sketch of a curve C with equation $y = f(x)$ where $f(x)$ is a cubic expression in x.
The curve
- passes through the origin
- has a maximum turning point at (2, 8)
- has a minimum turning point at (6, 0)

The set of values of x for which $f'(x) < 0$ are $2 < x < 6$.

The line with equation $y = k$, where k is a constant, intersects C at only one point.
The set of values of k are $k > 8$ or $k < 0$.

Find the equation of C. You may leave your answer in factorised form.

$y =$ .....

(3 marks)

Question 8

A curve has equation $y = f(x)$, where

$f(x) = (x - 4)(2x + 1)^2$

The curve with equation $y = f(x + a)$, where a is a constant, passes through the origin O.

State the possible values of a.

$a =$ .....

or $a =$ .....

(2 marks)

Question 9

Curve **C** has equation $y = \mathrm{f}(x)$
The graph of curve **C** has one maximum point.
The coordinates of this maximum point are $(3,5)$

Write down the coordinates of the maximum point on the curve with equation $y = \mathrm{f}(-x)$

(..... , ...)

(1 mark)

Mark scheme

Question 1

$g(-3) =$-16

−16	1	B1	cao

Question 2

20

$[g(5)=]2.5$ **or** $fg(x)=2\left(4-\frac{x+7}{x+3}\right)^2+3\left(4-\frac{x+7}{x+3}\right)$ oe		2	M1 finding g(5) or fg(x)
	20		A1 cas

Question 3

$2-\sqrt{\frac{x+5}{3}}$

$y=3(x^2-4x)+7$ **or** $y=3\left(x^2-4x+\frac{7}{3}\right)$ or $\frac{y-7}{3}=x^2-4x$ or $y=3(x-2)^2$.....		4	M1	for a correct equation for a first complete the square
eg $y=3\left((x-2)^2-2^2\right)+7$ **or** $y=3\left((x-2)^2-2^2+\frac{7}{3}\right)$ **or** $y=3(x-2)^2-5$ oe or			M1	
$(x-2)^2=\frac{y+5}{3}$ oe eg $(x-2)^2=\frac{y-7}{3}+4$ or $x-2=(\pm)\sqrt{\frac{y+5}{3}}$ oe			M1	
Correct answer scores full marks (unless from obvious incorrect working)	$2-\sqrt{\frac{x+5}{3}}$		A1 oe	NB: note only negative square r Must be in terms of x **any equivalent form**

Alternatively:

$3x^2-12x+(7-y)=0$		4	M1	for a correct first step
$(x=)\frac{12\pm\sqrt{144-12(7-y)}}{6}$			M1	
$(x=)2\pm\sqrt{\frac{60+12y}{36}}$ oe			M1	
Correct answer scores full marks (unless from obvious incorrect working)	$2-\sqrt{\frac{x+5}{3}}$		A1 oe	NB: note only negative square r Must be in terms of x **any equivalent form**

Question 4

$y = -2$

–2	2	B1 $y = -2$ or ft from line segment

Question 5

$k = 3$

3 nfww	3	**M2** for $12 = 16 - 4k + 8$ or better OR **M1** for $12 = -4^2 + -4 \times k + 8$ or sign errors in $12 = 16 - 4k + 8$ or better or $k = \frac{y - x^2 - 8}{x}$	Condone $^-4$ not in brackets but $12 = -4^2 + k - 4 + 8$ with no times sign or dot between k and $^-4$ scores **0** unless subsequently clarified.

Question 6

Equation	Graph
$y = \sin x$	C
$y = -\frac{3}{x}$	F
$y = 4x^3 - 5x$	A

C	3	B1	check diagrams
F		B1	check diagrams
A		B1	check diagrams

Question 7

$\frac{1}{4}x(x-6)^2$

States $y = ax(x-6)^2$ or $f(x) = ax(x-6)^2$	M1
Substitutes $(2,8)$ into $y = ax(x-6)^2$ and attempts to find a	dM1
$y = \frac{1}{4}x(x-6)^2$ or $f(x) = \frac{1}{4}x(x-6)^2$ o.e	A1
	(3)

Question 8

$a = -\frac{1}{2}$ or $a = 4$

$a = -\frac{1}{2}, (+)\ 4$	B1, B1

Question 9

$(-3, 5)$

	(−3, 5)	1	B1