AQA Qualifications

AQA Level 2 Certificate

FURTHER MATHEMATICS

Level 2 (8360)

Worksheet 8

Functions

Version 2.0

8 Functions

Question 1 (non-calculator)

$f(x) = 2x^3 - 250$

Work out x when $f(x) = 0$ *(3 marks)*

Question 2

$f(x) = x^2 + ax - 8$

$f(-3) = 13$

Work out the value of a. *(3 marks)*

Question 3

$f(x) = x^2 + 3x - 10$

Show that $f(x + 2) = x(x + 7)$ *(3 marks)*

Question 4

Work out the range for each of these functions.

(a) $f(x) = x^2 + 6$ for all x *(1 mark)*

(b) $f(x) = 3x - 5$ $-2 \leqslant x \leqslant 6$ *(2 marks)*

(c) $f(x) = 3x^4$ $x < -2$ *(1 mark)*

Question 5

(a) $f(x) = \frac{x + 2}{x - 3}$

Give a reason why $x > 0$ is **not** a suitable domain for $f(x)$. *(1 mark)*

(b) Give a possible domain for $f(x) = \sqrt{x - 5}$ *(1 mark)*

Question 6

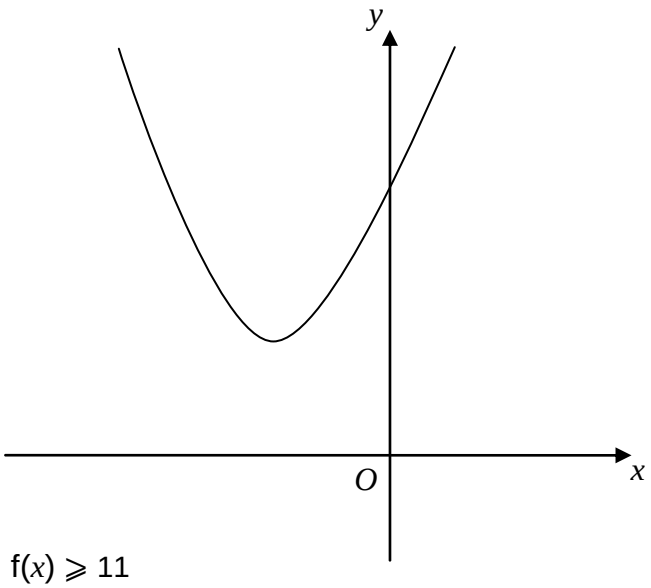
$f(x) = 3 - 2x$ $\quad a < x < b$

The range of $f(x)$ is $-5 < f(x) < 5$

Work out a and b. *(3 marks)*

Question 7

Here is a sketch of $f(x) = x^2 + 6x + a$ for all x, where a is a constant



The range of $f(x)$ is $f(x) \geqslant 11$

Work out the value of a. *(3 marks)*

Question 8

(a) Factorise $x^2 - 5x - 14$ *(2 marks)*

(b) Sketch the function $f(x) = x^2 - 5x - 14$ for all x.

Label the points of intersection with the x and y axes. *(3 marks)*

Question 9

$f(x) = -x^2$ $\quad 0 \leqslant x < 2$

-4 $\quad 2 \leqslant x < 3$

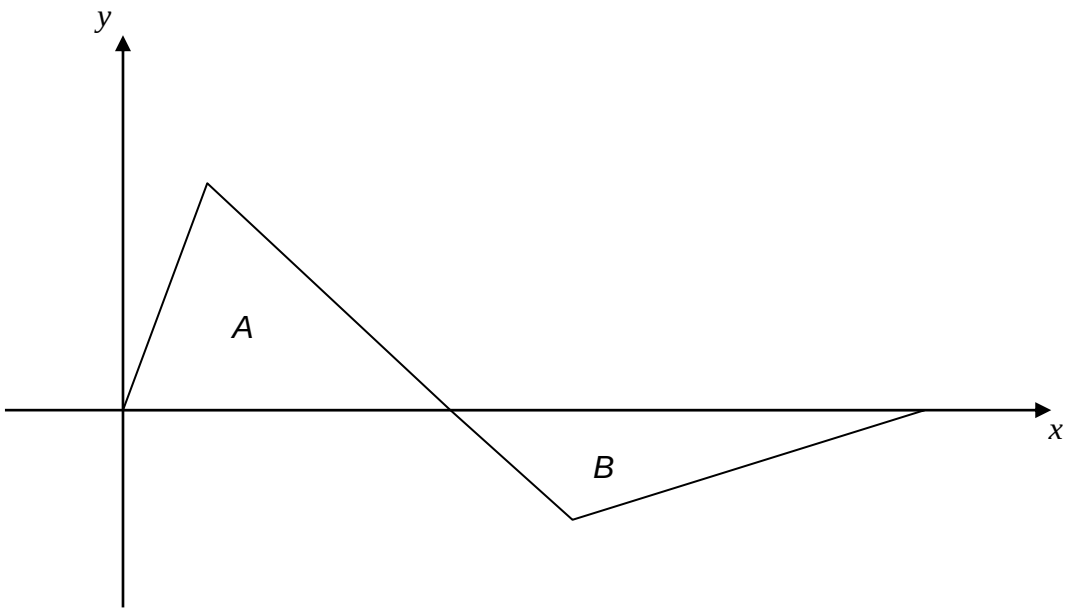
$2x - 10$ $\quad 3 \leqslant x \leqslant 5$

Draw the graph of $f(x)$ for values of x from 0 to 5 *(3 marks)*

Question 10

Here is a sketch of the function f(x) for values of x from 0 to 7.

$$f(x) = \begin{cases} 2x & 0 \leqslant x < 1 \\ 3 - x & 1 \leqslant x < 4 \\ \frac{x - 7}{3} & 4 \leqslant x \leqslant 7 \end{cases}$$

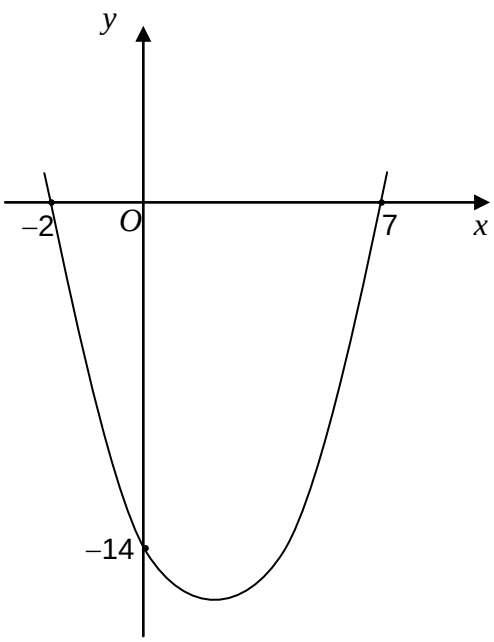


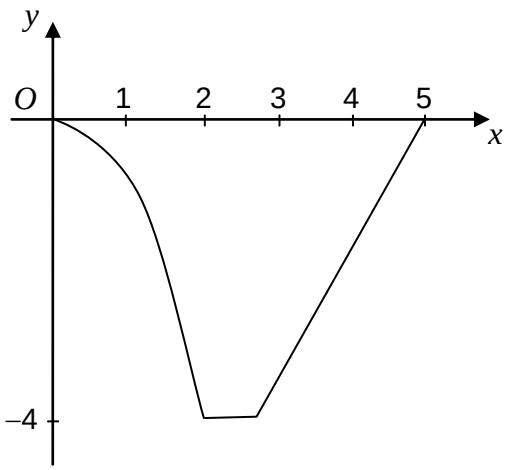
Show that

area of triangle A : area of triangle B = 3 : 2 *(4 marks)*

8 Functions

Question	Answer	Mark	Comments
1	$2x^3 - 250 = 0$ $x^3 = \frac{250}{2}$ $x = 5$	M1 M1 A1	 oe
2	$(-3)^2 + a(-3) - 8 = 13$ $9 - 8 - 13 = 3a$ $a = -4$	M1 M1 A1	 oe Allow 1 error
3	$(x + 2)^2 + 3(x + 2) - 10$ $x^2 + 2x + 2x + 4 + 3x + 6 - 10$ $x^2 + 7x$ $= x(x + 7)$	M1 M1 A1	 oe Allow 1 error
4(a)	$f(x) \ldots 6$	B1	
4(b)	$-11 \leqslant f(x) \leqslant 13$	B1	B1 For –11 or 13 seen
4(c)	$f(x) > 48$	B1	
5(a)	Not defined when $x = 3$ or cannot divide by 0 when $x = 3$	B1	oe
5(b)	$x \ldots a$ where $a \ldots 5$ or $x > a$ where $a \ldots 5$	B1	eg $x \ldots 5$ $x > 6$ Allow list of x values if all are … 5

Question	Answer	Mark	Comments
6	Either $3 - 2x = -5$ or $3 - 2x = 5$	M1	
	$a = -1$	A1	
	$b = 4$	A1	SC2 $a = 4$, $b = -1$
7	Attempt to complete the square in the form $(x + 3)^2$	M1	
	$(x + 3)^2 - 9 + a$	A1	oe
	$a = 20$	A1	
8(a)	$(x + a)(x + b)$	M1	$ab = -14$ or $a + b = -5$
	$(x - 7)(x + 2)$	A1	
8(b)		B3	B1 Curve through their (7, 0) and (–2, 0) (from 8(a)) B1 Curve through (0, –14) B1 Smooth U shape

Question	Answer	Mark	Comments
9		B3	B1 For each part
10	(3, 0) and (7, 0) marked or used (1, 2) and (4, –1) marked or used Either of their triangular areas calculated correctly $\frac{1}{2} \times 3 \times 2$ and $\frac{1}{2} \times 4 \times 1$ = 3 : 2	M1 M1 M1 A1	