AQA IGCSE FM "Full Coverage": Functions

This worksheet is designed to cover one question of each type seen in past papers, for each AQA IGCSE Further Maths topic. This worksheet was automatically generated by the DrFrostMaths Homework Platform: students can practice this set of questions interactively by going to www.drfrostmaths.com/homework, logging on, *Practise → Past Papers/Worksheets* (or *Library → Past/Past Papers* for teachers), and using the 'Revision' tab.

Question 1

Categorisation: Find the output of 'piecewise'/multi-part function for a given input.

[AQA IGCSE FM Practice paper set 2 P2 Q5b]

The function $f(x)$ is defined as

$$\begin{aligned} f(x) &= x^2 - 4 && 0 \le x < 3 \\ &= 14 - 3x && 3 \le x \le 5 \end{aligned}$$

Work out the value of $f(4)$

$f(4) =$ .....

Question 2

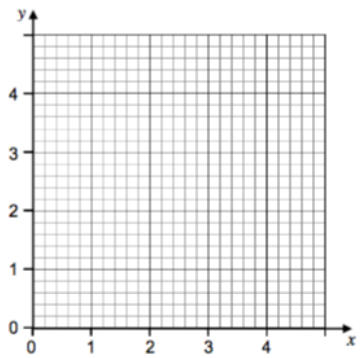
Categorisation: Determine the area enclosed under a piecewise function by first sketching.

[AQA IGCSE FM SAM P1 Q4]

A function $f(x)$ is defined as

$$\begin{aligned} f(x) &= 3x && 0 \le x < 1 \\ &= 3 && 1 \le x < 3 \\ &= 12 - 3x && 3 \le x \le 4 \end{aligned}$$

Calculate the area enclosed by the graph of $y = f(x)$ and the x-axis.



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Question 3

Categorisation: Draw a piecewise function given information about the gradients.

[AQA IGCSE FM Practice paper set 3 P1 Q10]

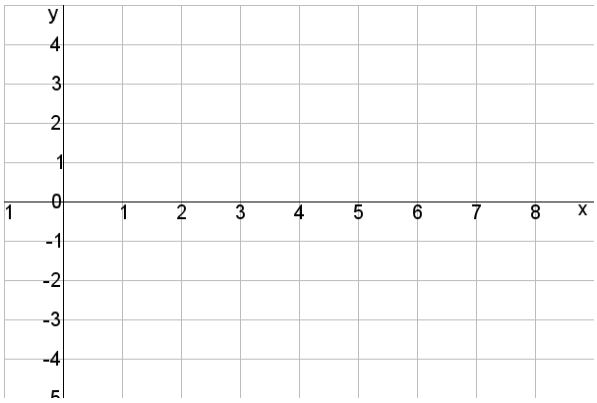
$y = f(x)$ is a continuous graph.

When $0 \leq x < 3$ $\frac{dy}{dx} = 2$ and this part of the graph passes through $(2,1)$

When $3 \leq x < 5$ $\frac{dy}{dx} = 0$

When $5 \leq x \leq 8$ $\frac{dy}{dx} = -1$

Draw the graph of $y = f(x)$ for $0 \leq x \leq 8$



Question 4

Categorisation: Determine the range of a piecewise function.

[AQA IGCSE FM Practice paper set 2 P2 Q5d]

The function $f(x)$ is defined as

$$f(x) = x^2 - 4 \qquad 0 \leq x < 3$$
$$= 14 - 3x \qquad 3 \leq x \leq 5$$

Work out the range of $f(x)$.

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Question 5

Categorisation: Determine the roots of a piecewise function (i.e. the inputs where the output is 0).

[AQA IGCSE FM Practice paper set 2 P2 Q5c]

The function $f(x)$ is defined as

$$\begin{aligned} f(x) &= x^2 - 4 && 0 \le x < 3 \\ &= 14 - 3x && 3 \le x \le 5 \end{aligned}$$

Solve $f(x) = 0$

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Question 6

Categorisation: Determine the inputs for which a particular output is obtained.

[AQA IGCSE FM Jan2013-P2 Q6c]

A function $f(x)$ is defined as

$$\begin{aligned} f(x) &= 4 && x < -2 \\ &= x^2 && -2 \le x \le 2 \\ &= 12 - 4x && x > 2 \end{aligned}$$

Solve $f(x) = -10$

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Question 7

Categorisation: Determine the number of solutions of an equation involving a piecewise function.

[AQA IGCSE FM Jan2013-P2 Q6b Edited]

A function $f(x)$ is defined as

$$\begin{aligned} f(x) &= 4 && x < -2 \\ &= x^2 && -2 \le x \le 2 \\ &= 12 - 4x && x > 2 \end{aligned}$$

Write down **how many** solutions there are to $f(x) = 3$

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Question 8

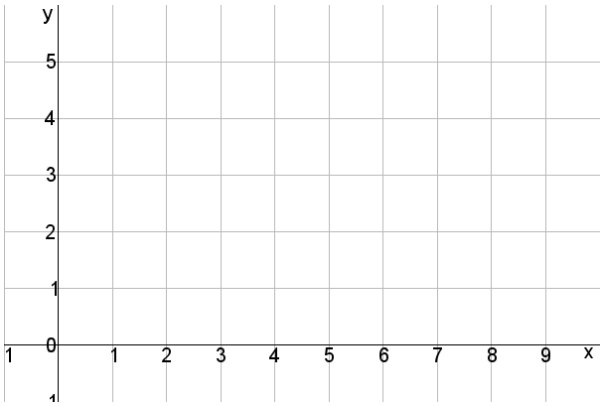
Categorisation: Sketch a piecewise function.

[AQA IGCSE FM Practice paper set 1 P1 Q2a]

A function $f(x)$ is defined as

$$\begin{aligned} f(x) &= 3 && 0 \le x < 2 \\ &= x + 1 && 2 \le x < 4 \\ &= 9 - x && 4 \le x \le 9 \end{aligned}$$

Draw the graph of $y = f(x)$ on the grid below for values of x from 0 to 9.

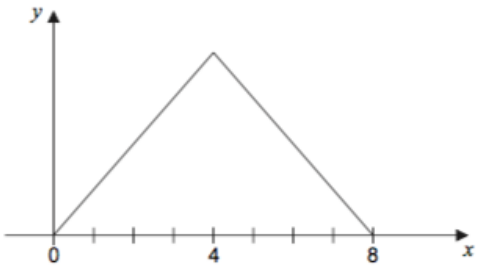


Question 9

Categorisation: Determine a piecewise function from its sketch.

[AQA IGCSE FM June2012-P2 Q15b Edited]

A sketch of $y = g(x)$ for domain $0 \le x \le 8$ is shown.



The graph is symmetrical about $x = 4$. The range of $g(x)$ is $0 \le g(x) \le 12$

Work out the function $g(x)$

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Question 10

Categorisation: Find a function when some other algebraic input is used, e.g. if $f(x) = x^2 + 2$, then $f(x+1) = (x+1)^2 + 2$

[AQA IGCSE FM SAM P2 Q4c]

The function $f(x)$ is defined as $f(x) = x^2 + x$

Write an expression for $f(x+1) - f(x)$

Give your answer in its simplest form.

$f(x+1) - f(x) =$ .....

Question 11

Categorisation: As above, but involving fraction manipulation.

[AQA IGCSE FM June2016-P2 Q24 Edited]

$$f(x) = \frac{x}{2x+1}$$

for positive values of x .

Work out $f(x+1) - f(x)$

Give your answer as a fraction in its simplest form.

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Question 12

Categorisation: As above, but used to solve an equation.

[AQA IGCSE FM June2012-P2 Q15a]

$f(x) = 3x - 5$ for all values of x .

Solve $f(x^2) = 43$

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Question 13

Categorisation: Find the roots of a function.

[AQA IGCSE FM SAM P2 Q4b]

The function $f(x)$ is defined as $f(x) = x^2 + x$

Solve $f(x) = 0$

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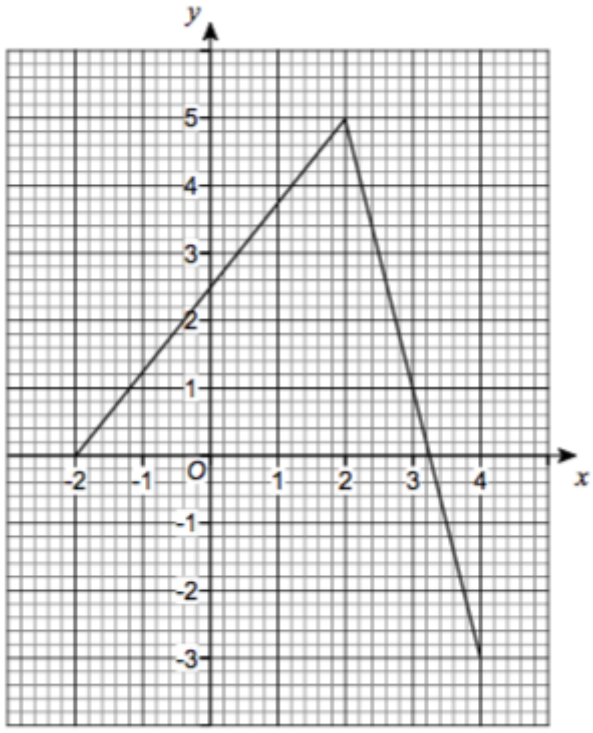
Question 14

Categorisation: Use a graph representing a function to solve an equation.

[AQA IGCSE FM Practice paper set 4 P2 Q9c]

The graph of $y = g(x)$ is shown for the full domain of $g(x)$.



Use the graph to solve $g(x) = 1$

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Question 15

Categorisation: Determine values that must be excluded from the domain of a function, involving a reciprocal function.

[AQA IGCSE FM SAM P2 Q8]

The function $f(x)$ is defined as

$$f(x) = \frac{1}{x^2 - 3x - 10}$$

$f(x)$ has domain all x except $x = a$ and $x = b$

Work out a and b .

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Question 16

Categorisation: As above, but involving a square root.

[Edexcel IGCSE Jan2012-4H Q17b]

$$f(x) = \sqrt{x - 6}$$

State which values of x must be excluded from a domain of f

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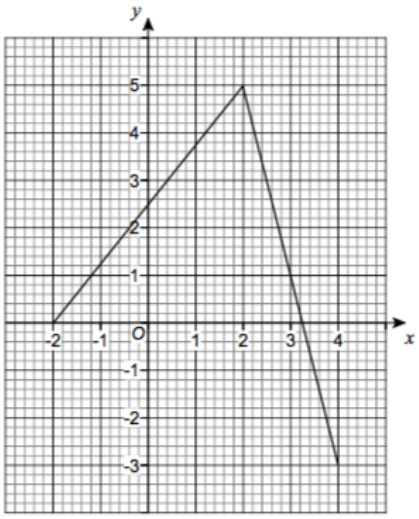
Question 17

Categorisation: Determine the range of a function given its sketch.

[AQA IGCSE FM Practice paper set 4 P2 Q9b]

The graph of $y = g(x)$ is shown for the full domain of $g(x)$.



State the range of $g(x)$

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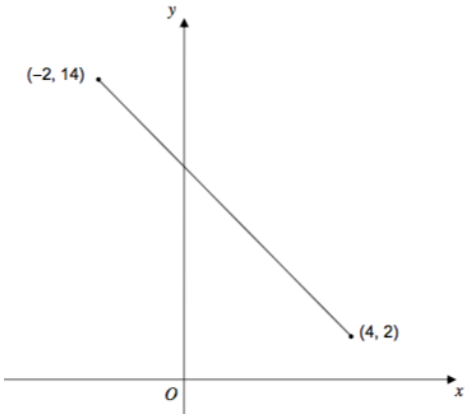
Question 18

Categorisation: Determine the domain of a function given its sketch.

[AQA IGCSE FM Practice paper set 3 P2 Q4a]

The straight line shows a sketch of $y = f(x)$ for the full domain of the function.



State the domain of the function.

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Question 19

Categorisation: Determine the range of a quadratic function.

[AQA IGCSE FM June2012-P1 Q1b]

$f(x) = 2x^2 + 7$ for all values of x .

What is the range of $f(x)$?

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Question 20

Categorisation: Determine the range of a quadratic function but first completing the square.

[AQA IGCSE FM Practice paper set 1 P2 Q8bii Edited]

The function $g(x)$ is defined as

$g(x) = x^2 - 4x + 5$ for all x

Write down the range of $g(x)$.

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Question 21

Categorisation: Determine the range of a function when the domain is restricted.

[AQA IGCSE FM June2015-P2 Q8a]

$$f(x) = x^4$$

The domain of $f(x)$ is $x \geq 2$

Work out the range of $f(x)$.

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Question 22

Categorisation: Determine the domain of a function with a restricted range.

[AQA IGCSE FM Practice paper set 1 P2 Q8a]

The function $f(x)$ is defined as

$f(x) = 22 - 7x \qquad -2 \leq x \leq p$

The range of $f(x)$ is $-13 \leq f(x) \leq 36$

Work out the value of p .

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Question 23

Categorisation: Determine the domain or range of trigonometric functions.

[AQA IGCSE FM Jan2013-P2 Q12c]

$f(x) = \sin x \quad 180^\circ \leq x \leq 360^\circ$

$g(x) = \cos x \quad 0^\circ \leq x \leq \theta$

You are given that $0 \leq g(x) \leq 1$

Work out the value of θ .

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Answers

Question 1

$f(4) = \ 2$

Question 2

9 units ^{2}

Question 3

Graph goes through points
$(0, -3), (3,3), (5,3), (8,0)$

Question 4

$f(x) \geq -4$ and $f(x) \leq 5$

Question 5

$x = 2$ or $x = \frac{14}{3}$

Question 6

$x = 5.5$

Question 7

3

Question 8

Graph goes through
$(0,3), (2,3), (4,5), (9,0)$

Question 9

$g(x) = 3x \qquad 0 \leq x \leq 4$
$\quad = -3x + 24 \qquad 4 < x \leq 8$

Question 10

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

Question 11

$\frac{1}{(2x+3)(2x+1)}$

Question 12

$x = 4$ and $x = -4$

Question 13

$x = 0$ or $x = -1$

Question 14

$x = -1.2$ or $x = 3$

Question 15

$a = -2$, $b = 5$

Question 16

$x < 6$

Question 17

$g(x) \geq -3$ or $g(x) \leq 5$

Question 18

$x \geq -2$ or $x \leq 4$

Question 19

$f(x) \geq 7$

Question 20

$g(x) \geq 1$

Question 21

$f(x) \geq 16$

Question 22

$p = 5$

Question 23

$\theta = 90$