"Full Coverage": Functions

This worksheet is designed to cover one question of each type seen in past papers, for each GCSE Higher Tier 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: Determine the output for a function given an input.

[Edexcel GCSE(9-1) Mock Set 1 Autumn 2016 3H Q20a]

For all values of x

$f(x) = 2x - 3$ and $g(x) = x^2 + 2$

(a) Find $g(-4)$

$g(-4) =$ .....

Question 2

Categorisation: Determine the input that would result in an output.

Given that

$$f(x) = 6x + 1$$

Find the value of x when

$$f(x) = 7$$

$x =$ .....

Question 3

Categorisation: Determine the input that would result in a given output, where the function involves algebraic fractions.

[Edexcel IGCSE May2015-3H Q17c]

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

Find the value of x for which $f(x) = 0$ Show clear algebraic working.

$x =$ .....

Question 4

Categorisation: Determine the input that would result in a given output, requiring use of the quadratic formula.

[Edexcel GCSE(9-1) Mock Set 2 Spring 2017 3H Q21b]

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

Given that $f(x) = 4$

(c) find the possible values of x .

Give your answer in the form $\frac{p \pm \sqrt{q}}{r}$ where p , q and r are positive integers.

.....

Question 5

Categorisation: Find the output expression for a function when some arbitrary input expression is used, e.g. if $f(x) = 2x + 3$, then $f(x^2) = 2x^2 + 3$ and $f(x + 1) = 2(x + 1) + 3$.

[Edexcel Specimen Papers Set 1, Paper 2H Q18]

$$f(x) = 3x^2 - 2x - 8$$

Express $f(x + 2)$ in the form $ax^2 + bx$

$f(x + 2) =$ .....

Question 6

Categorisation: As Question 5, but used to form a quadratic equation.

Let $f(x) = x^2 + x$

Solve $f(x - 1) + f(x + 1) = 6$

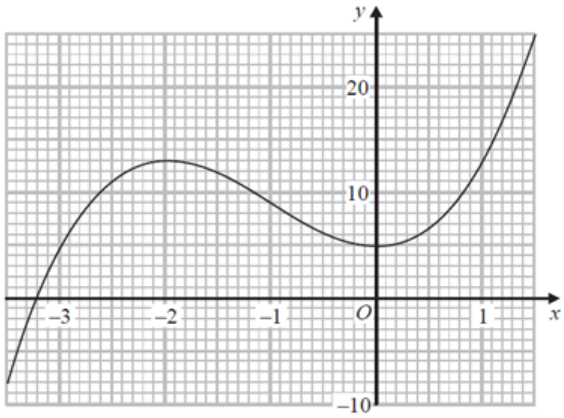
.....

Question 7

Categorisation: Use a graph representation of a function to find an output for a specified input.

[Edexcel IGCSE Jan2016-3H Q15a]

The diagram shows the graph of $y = f(x)$ for $-3.5 \leq x \leq 1.5$



Find $f(0)$

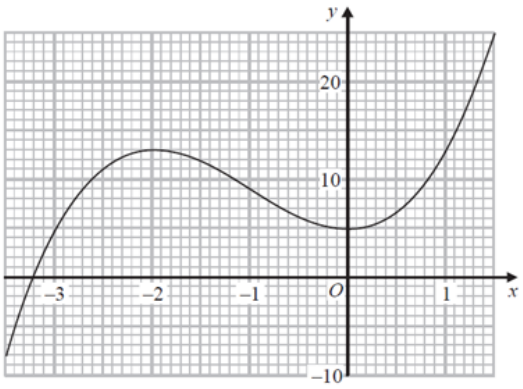
$f(0) =$ .....

Question 8

Categorisation: Using a graph representation of a function, reason about the input(s) that result in a specified output.

[Edexcel IGCSE Jan2016-3H Q15b]

The diagram shows the graph of $y = f(x)$ for $-3.5 \leq x \leq 1.5$



For which values of k does the equation $f(x) = k$ have only one solution?

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Question 9

Categorisation: Find the output of a composite function for a numerical input.

[Edexcel IGCSE May2016-4H Q17b]

f is the function such that $f(x) = 2x - 5$

g is the function such that $g(x) = x^2 - 10$

Find $fg(-4)$

.....

Question 10

Categorisation: Apply the same function multiple times, e.g. $ff(x)$ or $gg(x)$.

[Edexcel IGCSE May2016(R)-3H Q18b]

f is the function such that

$$f(x) = \frac{x}{3x + 1}$$

Find $ff(-1)$

.....

Question 11

Categorisation: Determine the input that would result in the output of a composite function.

[Edexcel IGCSE May2016-4H Q17d]

f is the function such that $f(x) = 2x - 5$

g is the function such that $g(x) = x^2 - 10$

Solve $gf(x) = -1$

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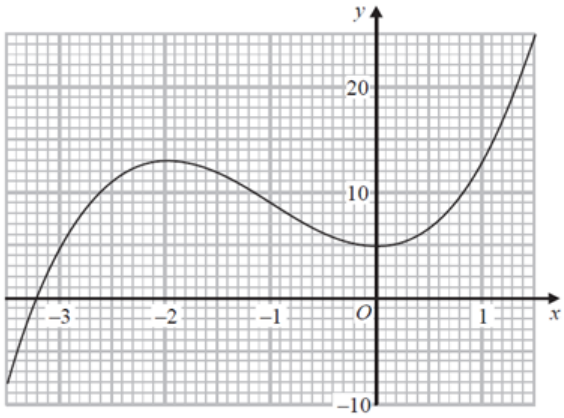
Question 12

Categorisation: Use a graph representation of a function combined with another algebraically specified function to determine the output of a composite function for a given input.

[Edexcel IGCSE Jan2016-3H Q15e]

The diagram shows the graph of $y = f(x)$ for $-3.5 \leq x \leq 1.5$



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

Find $fg(-3)$

$fg(-3) =$ .....

Question 13

Categorisation: Determine a composite function in terms of x.

[Edexcel GCSE(9-1) Mock Set 1 Autumn 2016 3H Q20b Edited]

For all values of x

$f(x) = 2x - 3$ and $g(x) = x^2 + 2$

(b) Determine $gf(x)$, giving your expression in its simplest form.

$gf(x) =$ .....

Question 14

Categorisation: Appreciate in general that $fg(x)$ is not necessarily $gf(x)$, and potentially use a combination of both to solve equations.

[Edexcel GCSE(9-1) Mock Set 1 Autumn 2016 3H Q20c]

For all values of x

$f(x) = 2x - 3$ and $g(x) = x^2 + 2$

(c) Solve $fg(x) = gf(x)$

.....

Question 15

Categorisation: Determine a composite function in terms of x, involving multiple applications of the same function.

[Edexcel Specimen Papers Set 2, Paper 2H Q9c]

The functions f and g are such that

$f(x) = 3(x - 4)$ and $g(x) = \frac{x}{5} + 1$

Find $ff(x)$, simplifying your expression.

$ff(x) =$ .....

Question 16

Categorisation: Deal with constants in functions,
e.g. if $f(x) = kx + 1$ then $f(2) = 2k + 1$

[Edexcel New SAMs Paper 3H Q10b]

The function f is such that

$$f(x) = 4x - 1$$

The function g is such that

$g(x) = kx^2$ where k is a constant.

Given that $fg(2) = 12$, work out the value of k

$k =$ .....

Question 17

Categorisation: Determine the inverse of simple linear functions.

[Edexcel IGCSE May2016-4H Q17c]

f is the function such that $f(x) = 2x - 5$

g is the function such that $g(x) = x^2 - 10$

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

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

Question 18

Categorisation: Determine the inverse of functions involving fractions.

[Edexcel Specimen Papers Set 2, Paper 2H Q9b]

The functions f and g are such that

$f(x) = 3(x - 4)$ and $g(x) = \frac{x}{5} + 1$

Find $g^{-1}(x)$

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

Question 19

Categorisation: Determine the inverse of a function where the subject appears multiple times.

[Edexcel IGCSE Jan2016(R)-3H Q16c]

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

Find $f^{-1}(x)$

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

Question 20

Categorisation: Appreciate the functions are only defined for certain inputs, e.g. $f(x) = \frac{1}{x}$ is not defined for 0, $f(x) = \sqrt{x}$ is not defined for negative inputs. IGCSE requires understanding of the terms 'domain' and 'range'.

[Edexcel GCSE(9-1) Mock Set 2 Spring 2017 3H Q21b]

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

(b) Write down a value of x for which $f(x)$ is not defined.

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Answers

Question 1

$g(-4) =$ 18

Question 2

$x = 1$

Question 3

$x = \frac{5}{4}$

Question 4

$\frac{3 \pm \sqrt{101}}{4}$

Question 5

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

Question 6

$x = -2$ or $x = 1$

Question 7

$f(0) =$ 5

Question 8

$k < 5$ or $k > 13$

Question 9

7

Question 10

$\frac{1}{5}$

Question 11

$x = 1$ or $x = 4$

Question 12

$fg(-3) =$ 9

Question 13

$gf(x) = 4x^2 - 12x + 11$

Question 14

$x = 1$ or $x = 5$

Question 15

$ff(x) = 9x - 48$

Question 16

$k = \frac{13}{16}$

Question 17

$f^{-1}(x) = \frac{1}{2}(x + 5)$

Question 18

$g^{-1}(x) = 5(x - 1)$

Question 19

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

Question 20

"-2 OR 3"