C20

Functions

CHAPTER ASSIGNMENT · 105 MARKS

Name _____ Class _____ No. _____ Date _____

Answer every question in the space given. Show your working. A fraction such as (3x + 2)/4 means the whole of 3x + 2 divided by 4.

Practice questions from *Cambridge IGCSE Mathematics Core and Extended* (4th edition), Chapter 20 (Functions), for classroom use. The Check yourself and Chapter quiz questions are Guru Jazzy's own.

Exercise 20.1 · Evaluating linear functions

20.1.1 If f(x) = 2x + 2, calculate:

a	b	c	d	e	f	g	h
f(2)	f(4)	f(0.5)	f(1.5)	f(0)	f(−2)	f(−6)	f(−0.5)

20.1.2 If f(x) = 4x − 6, calculate:

a	b	c	d	e	f	g	h
f(4)	f(7)	f(3.5)	f(0.5)	f(0.25)	f(−3)	f(−4.25)	f(0)

20.1.3 If g(x) = −5x + 2, calculate:

a	b	c	d	e	f	g	h
g(0)	g(6)	g(4.5)	g(3.2)	g(0.1)	g(−2)	g(−6.5)	g(−2.3)

20.1.4 If h(x) = −3x − 7, calculate:

a	b	c	d	e	f	g	h
h(4)	h(6.5)	h(0)	h(0.4)	h(−9)	h(−5)	h(−2)	h(−3.5)

Exercise 20.2 · Evaluating functions with fractions

20.2.1 If $f(x) = (3x + 2)/4$, calculate:

a	b	c	d	e	f	g	h
f(2)	f(8)	f(2.5)	f(0)	f(−0.5)	f(−6)	f(−4)	f(−1.6)

20.2.2 If $g(x) = (5x - 3)/3$, calculate:

a	b	c	d	e	f	g	h
g(3)	g(6)	g(0)	g(−3)	g(−1.5)	g(−9)	g(−0.2)	g(−0.1)

20.2.3 If $h: x \mapsto (-6x + 8)/4$, calculate:

a	b	c	d	e	f	g	h
h(1)	h(0)	h(4)	h(1.5)	h(−2)	h(−0.5)	h(−22)	h(−1.5)

20.2.4 If $f(x) = (-5x - 7)/(-8)$, calculate:

a	b	c	d	e	f	g	h
f(5)	f(1)	f(3)	f(−1)	f(−7)	f(−3/5)	f(−0.8)	f(0)

Exercise 20.3 · Evaluating quadratic and other functions

20.3.1 If $f(x) = x^2 + 3$, calculate:

a	b	c	d	e	f	g	h
f(4)	f(7)	f(1)	f(0)	f(−1)	f(0.5)	f(−3)	f(√2)

20.3.2 If $f(x) = 3x^2 - 5$, calculate:

a	b	c	d	e	f	g	h
f(5)	f(8)	f(1)	f(0)	f(−2)	f(√3)	f(−1/2)	f(−1/3)

20.3.3 If $g(x) = -2x^2 + 4$, calculate:

a	b	c	d	e	f	g	h
g(3)	g(1/2)	g(0)	g(1.5)	g(−4)	g(−1)	g(√5)	g(−6)

20.3.4 If $h(x) = (-5x^2 + 15)/(-2)$, calculate:

a	b	c	d	e	f	g	h
h(1)	h(4)	h(√3)	h(0.5)	h(0)	h(−3)	h(1/√2)	h(−2.5)

20.3.5 If $f(x) = -6x(x - 4)$, calculate:

a	b	c	d	e	f	g	h
f(0)	f(2)	f(4)	f(0.5)	f(−1/2)	f(−1/6)	f(−2.5)	f(√2)

20.3.6 If $g: x \mapsto (x + 2)(x - 4)/(-x)$, calculate:

a	b	c	d	e	f	g	h
g(1)	g(4)	g(8)	g(0)	g(−2)	g(−10)	g(−3/2)	g(−8)

Exercise 20.4 · Substituting expressions

20.4.1 If $f(x) = 2x + 1$, write the following in their simplest form: (a) $f(x + 1)$ · (b) $f(2x - 3)$ · (c) $f(x^2)$ · (d) $f(x/2)$ · (e) $f(x/4 + 1)$ · (f) $f(x) - x$ [6]

20.4.2 If $g(x) = 3x^2 - 4$, write the following in their simplest form: (a) $g(2x)$ · (b) $g(x/4)$ · (c) $g(\sqrt{(2x)})$ · (d) $g(3x) + 4$ · (e) $g(x - 1)$ · (f) $g(2x + 2)$ [6]

20.4.3 If $f(x) = 4x^2 + 3x - 2$, write the following in their simplest form: (a) $f(x) + 4$ · (b) $f(2x) + 2$ · (c) $f(x + 2) - 20$ · (d) $f(x - 1) + 1$ · (e) $f(x/2)$ · (f) $f(3x + 2)$ [6]

Exercise 20.5 · Finding inverse functions

20.5.1 Find the inverse of each of the following functions: (a) $f(x) = x + 3$ · (b) $f(x) = x + 6$ · (c) $f(x) = x - 5$ · (d) $g(x) = x$ · (e) $h(x) = 2x$ · (f) $p(x) = x/3$ [6]

20.5.2 Find the inverse of each of the following functions: (a) $f(x) = 4x$ · (b) $f(x) = 2x + 5$ · (c) $f(x) = 3x - 6$ · (d) $f(x) = (x + 4)/2$ · (e) $g(x) = (3x - 2)/4$ · (f) $g(x) = (8x + 7)/5$ [6]

20.5.3 Find the inverse of each of the following functions: (a) $f(x) = \frac{1}{2}x + 3$ · (b) $g(x) = \frac{1}{4}x - 2$ · (c) $h(x) = 4(3x - 6)$ · (d) $p(x) = 6(x + 3)$ · (e) $q(x) = -2(-3x + 2)$ · (f) $f(x) = \frac{2}{3}(4x - 5)$ [6]

Exercise 20.6 · Evaluating inverse functions

20.6.1 If $f(x) = x - 4$, evaluate: (a) $f^{-1}(2)$ · (b) $f^{-1}(0)$ · (c) $f^{-1}(-5)$ [3]

20.6.2 If $f(x) = 2x + 1$, evaluate: (a) $f^{-1}(5)$ · (b) $f^{-1}(0)$ · (c) $f^{-1}(-11)$ [3]

20.6.3 If $g(x) = 6(x - 1)$, evaluate: (a) $g^{-1}(12)$ · (b) $g^{-1}(3)$ · (c) $g^{-1}(6)$ [3]

20.6.4 If $g(x) = (2x + 4)/3$, evaluate: (a) $g^{-1}(4)$ · (b) $g^{-1}(0)$ · (c) $g^{-1}(-6)$ [3]

20.6.5 If $h(x) = \frac{1}{3}x - 2$, evaluate: (a) $h^{-1}(-1/2)$ · (b) $h^{-1}(0)$ · (c) $h^{-1}(-2)$ [3]

20.6.6 If $f(x) = (4x - 2)/5$, evaluate: (a) $f^{-1}(6)$ · (b) $f^{-1}(-2)$ · (c) $f^{-1}(0)$ [3]

Exercise 20.7 · Composite functions

20.7.1 Write a formula for fg(x) in each of the following:

Part	f(x)	g(x)	fg(x)
a	x − 3	x + 5	
b	x + 4	x − 1	
c	x	2x	
d	x/2	2x	

20.7.2 Write a formula for pq(x) in each of the following:

Part	p(x)	q(x)	pq(x)
a	2x	x + 4	
b	3x + 1	2x	
c	4x + 6	2x − 1	
d	−x + 4	x + 2	

20.7.3 Write a formula for jk(x) in each of the following:

Part	j(x)	k(x)	jk(x)
a	(x − 2)/4	4x	
b	3x + 2	(x − 3)/2	
c	(2x + 5)/3	½x + 1	
d	¼(x − 3)	(8x + 2)/5	

20.7.4 Evaluate fg(2) in each of the following:

Part	f(x)	g(x)	fg(2)
a	$x - 4$	$x + 3$	
b	$2x$	$-x + 6$	
c	$3x$	$6x + 1$	
d	$x/2$	$-2x$	

20.7.5 Evaluate gh(−4) in each of the following:

Part	g(x)	h(x)	gh(−4)
a	$3x + 2$	$-4x$	
b	$\frac{1}{2}(3x - 1)$	$2x/5$	
c	$4(-x + 2)$	$(2x + 6)/4$	
d	$(4x + 4)/5$	$-\frac{1}{3}(-x + 5)$	

Student assessment 1

SA1.1 For the function $f(x) = 5x - 1$, evaluate: (a) $f(2)$ · (b) $f(0)$ · (c) $f(-3)$ [3]

SA1.2 For the function $g: x \mapsto (3x - 2)/2$, evaluate: (a) $g(4)$ · (b) $g(0)$ · (c) $g(-3)$ [3]

SA1.3 For the function $f(x) = (x + 3)(x - 4)/2$, evaluate: (a) $f(0)$ · (b) $f(-3)$ · (c) $f(-6)$ [3]

SA1.4 Find the inverse of each of the following functions: (a) $f(x) = -x + 4$ · (b) $g(x) = 3(x - 6)/2$ [4]

SA1.5 If $h(x) = (3/2)(-x + 3)$, evaluate: (a) $h^{-1}(-3)$ · (b) $h^{-1}(3/2)$ [4]

SA1.6 If $f(x) = 4x + 2$ and $g(x) = -x + 3$, find $fg(x)$. [2]

Student assessment 2

SA2.1 For the function $f(x) = 3x + 1$, evaluate: (a) $f(4)$ · (b) $f(-1)$ · (c) $f(0)$ [3]

SA2.2 For the function $g: x \mapsto (-x - 2)/3$, evaluate: (a) $g(4)$ · (b) $g(-5)$ · (c) $g(1)$ [3]

SA2.3 For the function $f(x) = x^2 - 3x$, evaluate: (a) $f(1)$ · (b) $f(3)$ · (c) $f(-3)$ [3]

SA2.4 Find the inverse of the following functions: (a) $f(x) = -3x + 9$ · (b) $g(x) = (x - 2)/4$ [4]

SA2.5 If $h(x) = -5(-2x + 4)$, evaluate: (a) $h^{-1}(-10)$ · (b) $h^{-1}(0)$ [4]

SA2.6 If f(x) = 8x + 2 and g(x) = 4x − 1, find fg(x). [2]

Check yourself

1 Using f(x) = 2x as an example, explain why $f^{-1}(x)$ is not the same as 1/f(x). [2]

2 f(x) = 3x − 4. Find the value of x for which f(x) = $f^{-1}(x)$. [3]

3 f(x) = x + 5 and g(x) = 2x. Show that fg(x) and gf(x) are different. [3]

4 f(x) = 2x − 1. Find ff(x) in its simplest form. [2]

5 A function machine multiplies its input by 4 and then subtracts 7. Write the function as f(x) = ..., then write its inverse $f^{-1}(x)$. [3]

Chapter quiz

Q1 If $f(x) = 3x - 5$, what is $f(-2)$?

A	B	C	D
−1	−11	1	11

Q2 If $f(x) = x^2 + 4$, what is $f(-3)$?

A	B	C	D
−5	10	13	1

Q3 If $f(x) = (2x + 6)/3$, what is $f(3)$?

A	B	C	D
2	6	4	12

Q4 If $f(x) = 2x + 1$, what is $f(x + 1)$ in its simplest form?

A	B	C	D
$2x + 1$	$2x + 2$	$x + 2$	$2x + 3$

Q5 If $g(x) = 3x^2$, what is $g(2x)$?

A	B	C	D
$6x^2$	$12x^2$	$3x^2 + 2$	$36x^2$

Q6 What does $f^{-1}(x)$ mean?

A	B	C	D
1 divided by f(x)	f(x) multiplied by −1	f(x) squared, then halved	The inverse: the function that undoes f

Q7 Find the inverse of $g(x) = 2x - 3$.

A	B	C	D
$(x - 3)/2$	$2x + 3$	$(x + 3)/2$	$x/2 + 3$

Q8 If $f(x) = (x - 3)/3$, what is $f^{-1}(2)$?

A	B	C	D
3	5	−1/3	9

Q9 If $f(x) = x + 2$ and $g(x) = x + 3$, what is $fg(x)$?

A	B	C	D
$x^2 + 5x + 6$	$x + 5$	$2x + 5$	$x + 6$

Q10 In $fg(x)$, which function is applied to x first?

A	B	C	D
f	g	Whichever is simpler	Both at the same time

Q11 If $f(x) = 2x + 3$ and $g(x) = 2x$, what is $fg(3)$?

A	B	C	D
12	9	15	18

Q12 If $f(x) = 2x - 1$ and $g(x) = x - 2$, what is $gf(x)$?

A	B	C	D
$2x - 5$	$2x - 3$	$2x - 1$	$x - 3$

End of assignment · Check your answers against the chapter at gurujazzy.com/subjects/o-level-mathematics/chapter-20-functions/