

Mathematics: Analysis and Approaches – Higher Level

**Compiled by Sotiris Avdalas PRACTICE PAPER 6** 

**Topic 2. Functions** 

1.	[Maximum	mark: 61	<b>[without</b>	GDC <sup>1</sup>
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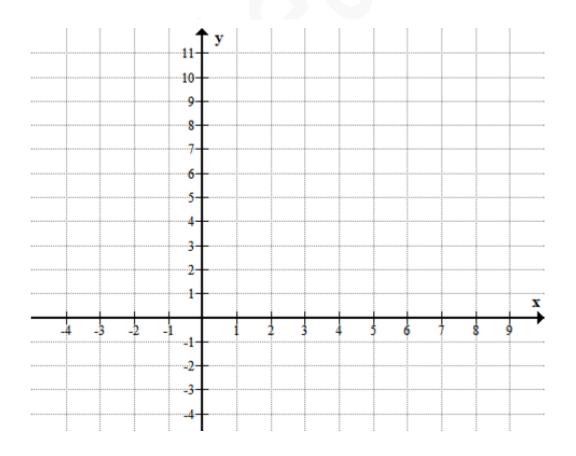
The polynomial $p(x)$ $b$ is divisible by $(x-2)$ and has a remainder $-6$ when divided by $(x+1)$ .  (a) Find the value of $a$ and of $b$ .  [4]  (b) Factorise completely $p(x)$ and state its roots.  [2]	Ι.	[Maximum mark: 6] [Without GDC]	
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	(a)	Find the value of $a$ and of $b$ .	[4]
	(b)	Factorise completely $p(x)$ and state its roots.	[2]
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#### 2. [Maximum mark: 10] [without GDC]

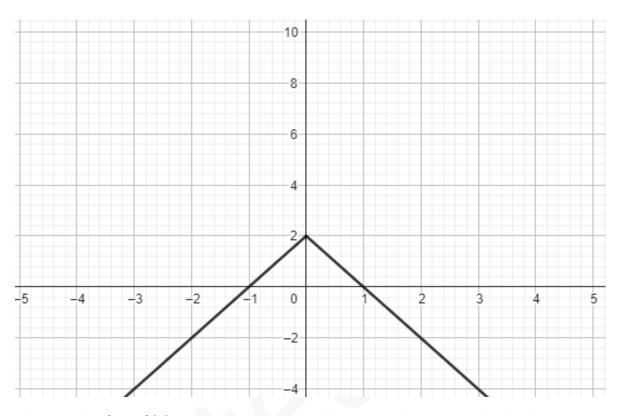
(a) Solve the equation $ x - 10  = 12 - x$	[5]
(b) Solve the inequality $ x-8  < x-6$	[5]
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### 3. [Maximum mark: 6] [without GDC]

Draw the graph of $f(x) =  x - 2  -  x $	[6]



### 4. [Maximum mark: 5] [without GDC]



The graph of $y = f(x)$ is shown above. On the same diagram, sketch the		
graph of $y=f(x)^2$	[5]	
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### 5. [Maximum mark: 12] [without GDC]

Let a and b be the roots of the qua	adratic f(x) = x	$x^2 - /x + 1$ .	
(a) Write down the values of (i) a+	b (ii) ab.		[3]
(b) Find the values of (i) a <sup>2</sup> +b <sup>2</sup>	(ii) a <sup>3</sup> +b <sup>3</sup>		[3]
(c) Find a quadratic with integer co	pefficients which	has roots 2a+3,2	b+3
			[3]
(d) Find a quadratic with integer co		u b	[3]
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#### 6. [Maximum mark: 6] [without GDC]

Solve the inequalities

(a) 
$$(x-3)^{2025}(2-4x)^7(x+1)^2 > 0$$
 [3]

(b) 
$$\frac{(x^2-9)(2-x)}{x+1} \le 0$$
 [3]


### 7. [Maximum mark: 7] [without GDC]

Find all the asymptotes (horizontal, vertical, or oblique) of

$f(x) = \frac{4x^3 + 1}{x^2 - 3x + 2}.$	[7]
X -3X+2	
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### 8. [Maximum mark: 6] [without GDC]

(a) Express $y = 2x^2 - 8x + 1$ in the form $y = 2(x - c)^2 + d$ .	[3]
The graph of $y = x^2$ is transformed into the graph of $y = 2x^2 - 8x + 1$ transformations	by the
a vertical stretch with scale factor k followed by	
a horizontal translation of p units followed by	
a vertical translation of q units.	
(b) Write down the value of	
(i) k;	
(ii) p;	
(iii) q.	[3]

#### 9. [Maximum mark: 8] [without GDC]

Solve the equations (a)  $3^{2x+1} = 3^{x-1} + 26$ . [4] (b)  $x^{\log_3 x} = 81$ . [4]



### 10. [Maximum mark: 10] [with GDC]

Consider the function $y = f(x)$ with $f(x) = 2e^{0.4x} + 3$	
(a) Write down the domain of $f$ .	[1]
(b) Find the y-intercept of the graph.	[2]
(c) Find	
(i) f (2) correct to 3sf.	
(ii) f <sup>-1</sup> (5).	[3]
(d) Find the first integer value of x for which the value of y will exceed	d 80. [2]
(e) Write down the range of f	[2]

### 11. [Maximum mark: 8] [without GDC]

Let $f(x) = x^2 - 6x + 2, x \le 3$ . Find $f^{-1}(x)$	[8]
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#### 12. [Maximum mark: 10] [without GDC]

Let 
$$f(x) = \frac{x^3 + 8}{x^2 - 4x + 3}$$
.

- (a) Find the quotient and the remainder of the long division of  $x^3 + 8$  by  $x^2 4x + 3$ .
- (b) **Hence,** express f(x) in the form  $f(x) = q(x) + \frac{ax+b}{x^2-4x+3}$  [2]
- (c) Write down all the asymptotes of y = f(x) [3]
- (d) Express f(x) in the form  $f(x) = q(x) + \frac{A}{x-3} + \frac{B}{x-1}$ . [2]

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