

Question 1	<i>(12 Marks)</i>	Marks
(a)	Factorise	
(i)	$y^3 - 125$	2
(ii)	$1 - x - x^2 + x^3$	3
(b)	Solve $2x^2 = 7x - 5$	3
(c)	Solve $x^2 + 2x - 5 = 0$ by completing the square. Give your answers correct to two decimal places.	4
Question 2	<i>(12 Marks) Start a new page</i>	
(a)	Solve for x : $3x^2 + 6x - 7 = 0$, Leave your answer in simplest surd form.	3
(b)	Simplify	5
(i)	$\frac{x+2}{x-2} - \frac{x-2}{x+2}$	
(ii)	$\frac{2x-y}{y^2-xy-2x^2}$	
(c)	The perimeter of a rectangle is 40 cm and its area is 84 cm^2 .	4
(i)	If the width of the rectangle is x , express the length in terms of x .	
(ii)	Write down the area of the rectangle in terms of x .	
(iii)	Form a quadratic equation in x and solve it to find the length and width of the rectangle.	

- Question 3** (12 Marks) *Start a new page* **Marks**
- (a) Simplify $\frac{x^2 - 2x - 3}{2x^2 - 3x - 5} \times \frac{4x^2 - 25}{(x - 3)(2x + 5)}$. **3**
- (b) Simplify $2\sqrt{8} - \sqrt{18}$. **2**
- (c) If $\frac{\sqrt{3} - 4}{2 + \sqrt{3}} = a + b\sqrt{3}$, find a and b . **3**
- (d) Find the domain and range of **4**
- (i) $f(x) = (1 + x)^2 - 1$
- (ii) $f(x) = -\sqrt{9 - x^2}$
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- Question 4** (12 Marks) *Start a new page*
- (a) Draw a neat sketch of each of the graphs below. **7**
- (i) $y = \frac{1}{x}$.
- (ii) $y = \frac{1}{x + 3} - 2$. State the y - intercept and the equation of each asymptote.
- (b) Find the simultaneous solution for the following equations: **5**
- $x^2 + y^2 = 1681$ and $xy = 360$

End of Paper

Ext 1 Assessment 1 2012 Solutions

Q1 (a)(i) $y^3 = 125 = (y-5)(y^2+5y+25)$ ✓✓ (2)

(1A) (ii) $1-x-x^2+x^3 = (1-x)-x^2(1-x)$ ✓
 $= (1-x)(1-x^2)$ ✓
 $= (1-x)(1-x)(1+x)$ ✓ (3)
 $= (1-x)^2(1+x)$

(b) $2x^2 - 7x + 5 = 0$ ✓

$(2x-5)(x-1) = 0$ ✓

$x = \frac{5}{2}$ $x = 1$ ✓ (3)

Missing = 0

lose a (5 marks)

mark

(c) $x^2 + 2x + 1 = 5 + 1$ ✓

$(x+1)^2 = 6$ ✓

$x+1 = \pm\sqrt{6}$ ✓

$x = -1 \pm\sqrt{6}$ ✓

$x = +1.45, -3.45$ ✓ (2dps) (4)

(4 marks)

Question 2

(12)

a) $3x^2 + 6x - 7 = 0$

$$x = \frac{-6 \pm \sqrt{36 - 4 \times 3 \times -7}}{2 \times 3} \checkmark$$

$$= \frac{-6 \pm \sqrt{120}}{6} \checkmark$$

$$= \frac{-6 \pm 2\sqrt{30}}{6} \checkmark$$

$$= \frac{-3 \pm \sqrt{30}}{3} \checkmark$$

b) i)

$$\frac{(x+2)(x+2) - (x-2)(x-2)}{(x-2)(x+2)} \checkmark$$
$$= \frac{x^2 + 4x + 4 - (x^2 - 4x + 4)}{x^2 - 4} \checkmark$$
$$= \frac{8x}{x^2 - 4} \checkmark$$

ii)

$$\frac{2x - y}{(y-2x)(y+x)} \checkmark$$
$$= \frac{-1}{y+x} \checkmark$$

c)

$$2(x+y) = 40$$

$$x+y = 20$$

$$y = 20 - x$$

i) ~~width~~ ^{length} = $20 - x$ ✓

ii) Area = $(20 - x)x$ ✓

iii) $(20 - x)x = 84$

$$20x - x^2 = 84$$

$$0 = x^2 - 20x + 84$$

$$0 = (x - 14)(x - 6) \checkmark$$

∴ width is 6 and length is 14 ✓

Q3

$$(a) \frac{x^2 - 2x - 3}{2x^2 - 3x - 5} \times \frac{4x^2 - 25}{(x-3)(2x+5)}$$

$$= \frac{(x-3)(x+1)}{(2x-5)(x+1)} \times \frac{(2x-5)(2x+5)}{(x-3)(2x+5)} \quad (3)$$

$$= \cancel{1} \quad \checkmark$$

$$(b) \quad 2\sqrt{8} - \sqrt{18} = 4\sqrt{2} - 3\sqrt{2} \quad \checkmark \quad (2)$$

$$= \sqrt{2} \quad \checkmark$$

$$(c) \quad \frac{\sqrt{3}-4}{2+\sqrt{3}} = \frac{\sqrt{3}-4}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} \quad \checkmark$$

$$= \frac{2\sqrt{3} - 3 - 8 + 4\sqrt{3}}{4-3} \quad \checkmark \quad (3)$$

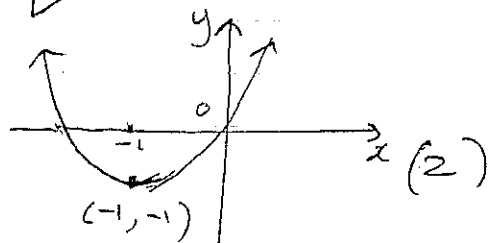
$$= 6\sqrt{3} - 11 = -11 + 6\sqrt{3} \quad \checkmark$$

$\therefore a = -11$ and $b = 6$ \checkmark

$$(d) \quad (i) \quad f(x) = (1+x)^2 - 1$$

Domain: All real x \checkmark

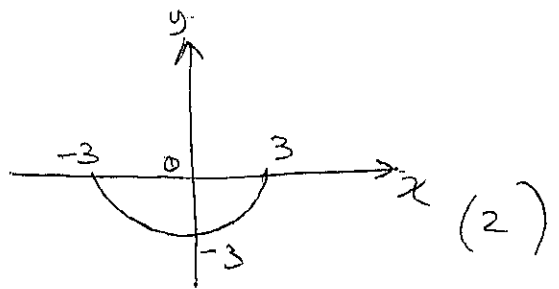
Range: $y: y \geq -1$ \checkmark



$$(ii) \quad f(x) = -\sqrt{9-x^2}$$

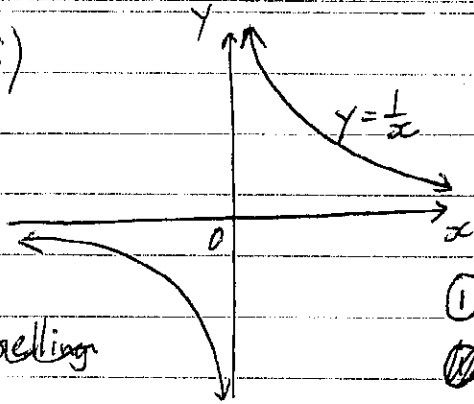
Domain: $-3 \leq x \leq 3$ \checkmark

Range: $-3 \leq y \leq 0$ \checkmark



Solutions & Marking Scheme

4 (a) (i)

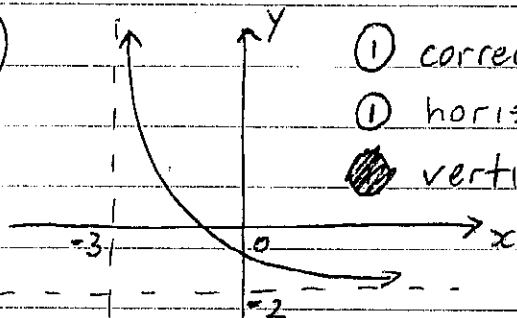


~~Diagram~~ labelling

① correct shape

~~Diagram~~

(ii)



① correct shape

① horiz. trans. and/or vertical trans

① correct curve

~~Diagram~~

$$y = \frac{1}{x+3} - 2$$

$$y\text{-int} = \frac{1}{3} - 2 = -\frac{5}{3} \quad \text{①}$$

$$\text{asymptotes: } x = -3, y = -2 \quad \text{②}$$

$$(b) \quad x^2 + y^2 = 1681 \quad \text{--- ①}$$

$$2xy = 720 \quad \text{--- ②}$$

① + ②

$$(x+y)^2 = 2401$$

$$x+y = \pm 49 \quad \text{--- ③}$$

$$x+y = 49 \quad \text{--- ③}$$

$$x+y = -49 \quad \text{--- ④}$$

① - ②

$$(x-y)^2 = 961$$

$$x-y = \pm 31$$

$$x-y = 31 \quad \text{--- ⑤}$$

$$x-y = -31 \quad \text{--- ⑥}$$

$$\text{③} + \text{⑤} \Rightarrow x = 40$$

$$\text{sub in ③, } y = 9$$

$$\text{③} + \text{⑥} \Rightarrow x = 9$$

$$\text{sub in ③, } y = 40$$

$$\text{④} + \text{⑤} \Rightarrow x = -9$$

$$\text{sub in ④, } y = -40$$

$$\text{④} + \text{⑥} \Rightarrow x = -40$$

$$\text{sub in ④, } y = -9$$

\therefore Solution:

$$x = 40, y = 9 \text{ or } x = 9, y = 40$$

$$\text{or } x = -40, y = -9 \text{ or } x = -9, y = -40$$

Part (b)

1 mark for each solution

1 mark for demonstrated method

or

1 mark for a correct substitution of $\frac{360}{x}$ or $\frac{360}{y}$

1 mark for an attempt to ~~form~~ quad eqn formula to find x^2 , or compl. square in x^2 .

1 mark for $x^2 = k$, ~~or~~

1 mark for one correct solution

1 mark for all correct solutions.