



### Question 1

- a) Express 54 808 correct to 2 significant figures (1)
- b) Express 0.000532 in scientific notation (1)
- c) Simplify  $\sqrt{\frac{a^2b^6}{a^6b^4}}$  (2)
- d) Express  $0.\dot{2}\dot{1}$  as a fraction in simplest form (2)
- e) The area of a trapezium is given by  $A = \frac{h}{2}(a + b)$  (2)

Find the value of  $a$  given  $A = 624$ ,  $h = 26$  and  $b = 18$

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### Question 2

- a) Expand and simplify  $(a + b)(a - b) - a(a - 2b)$  (2)
- b) Simplify  $\frac{x-1}{2} + \frac{x-3}{3}$  (2)
- c) Solve  $|1 - 2x| = 5$  (2)
- d) Simplify  $(2\sqrt{5})^3$  (2)
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### Question 3

- a) Factorise fully
- i)  $6x^2 - 7x - 3$  (2)
- ii)  $x^4 - 16$  (2)
- iii)  $z^3 - z^2 + z - 1$  (2)
- iv)  $y^3 - 8$  (2)

#### Question 4

- a) Simplify  $\frac{3x - x^2}{9 - x^2}$  (2)
- b) Solve simultaneously for  $x$  and  $y$  (3)
- $$3x - 2y = 29$$
- $$4x + 5y = 8$$
- c) Express  $\frac{2}{2 - \sqrt{3}}$  in the form  $a + \sqrt{b}$  where  $a$  and  $b$  are rational (3)
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#### Question 5

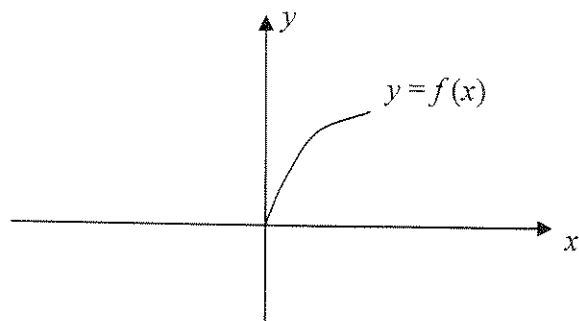
- a) Solve  $\frac{x-3}{2} - \frac{4-2x}{3} = 1$  (3)
- b) Consider the function  $y = \sqrt{10-x}$
- i) Explain why the domain of this function is restricted. (1)
- ii) Hence state the natural domain of  $y = \sqrt{10-x}$  (1)
- c) How many points of intersection have the graphs of  $x^2 + y^2 = 4$  and  $y = x^2 + 4$ ? (3)
- Justify your answer graphically.
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#### Question 6

- a) Sketch the following functions. Label any important points.
- i)  $y = \sqrt{9-x^2}$  (1)
- ii)  $y = x^2 + 4x - 5$  (2)
- b) Solve  $|2x+1| = 3x-2$  (3)
- c) Factorise  $9 - (x+y)^2$  (2)
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### Question 7

- a) The diagram shows part of a function  $y = f(x)$  (1)



- i) Copy the diagram onto your answer sheet  
ii) Complete the graph of  $y = f(x)$  given that it is an odd function.
- b) Find the exact solutions of  $x(2x+1) = 2$  (3)
- c) i) On the same number plane, graph  $y = |x-1|$  and  $y = |x+2|$  (2)  
ii) Hence or otherwise solve  $|x-1| = |x+2|$  (2)
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### Question 8

- a) For what value/s of  $x$  is  $x \times x < x + x$ ? (2)
- b) Consider the function  $y = 1 + \frac{1}{x}$
- i) For what value of  $x$  is the function undefined? (1)  
ii) Find the  $x$  intercept (1)  
iii) What is the equation of the horizontal asymptote (1)  
iv) Hence sketch the curve (3)

End of Paper

Question 1

a) 55 000 or  $5.5 \times 10^4$

b)  $5.32 \times 10^{-4}$

c)  $\sqrt{\frac{b^2}{a^4}} = \frac{b}{a^2}$

d) let  $x = 0.\dot{2}\dot{1}$   
 $100x = 21.21\dots$

$99x = 21$

$\therefore 0.\dot{2}\dot{1} = \frac{7}{33}$

e)  $A = \frac{h}{2}(a+b)$   
 $624 = \frac{26}{2}(a+18)$

$48 = a + 18$

$a = 30$

Question 2

a)  $a^2 - b^2 - a^2 + 2ab$   
 $= \underline{2ab - b^2}$

b)  $\frac{3x-3}{6} + \frac{2x-6}{6}$   
 $= \underline{\underline{\frac{5x-9}{6}}}$

c)  $1 - 2x = 5$  or  $1 - 2x = -5$   
 $2x = -4$                        $2x = 6$   
 $\therefore \underline{\underline{x = -2}}$                        $\underline{\underline{x = 3}}$

d)  $2\sqrt{5} \times 2\sqrt{5} \times 2\sqrt{5} = 8 \times 5\sqrt{5}$   
 $= \underline{\underline{40\sqrt{5}}}$

Question 3

a) i.  $(3x+1)(2x-3)$

ii.  $(x^2 - 4)(x^2 + 4)$   
 $= \underline{\underline{(x+2)(x-2)(x^2+4)}}$

iii.  $z^2(z-1) + (z-1)$   
 $= \underline{\underline{(z-1)(z^2+1)}}$

iv.  $(y-2)(y^2+2y+4)$

Question 4

a)  $\frac{x(3-x)}{(3+x)(3-x)} = \underline{\underline{\frac{x}{3+x}}}$

b)  $3x - 2y = 29$       ①

$4x + 5y = 8$         ②

①  $\times 4$  :  $12x - 8y = 116$       ③

②  $\times 3$  :  $12x + 15y = 24$       ④

④ - ③

$23y = -92$

$y = -4$

$3x - 2(-4) = 29$

$3x = 21$

$x = 7$

$\therefore \underline{\underline{x = 7, y = -4}}$

c)  $\frac{2}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$   
 $= \frac{4+2\sqrt{3}}{4-3}$   
 $= 4+2\sqrt{3}$   
 $= \underline{\underline{4+\sqrt{12}}}$

Question 5

a)  $6 \times \frac{x-3}{2} - 6 \times \frac{4-2x}{3} = 1 \times 6$

$3(x-3) - 2(4-2x) = 6$

$3x - 9 - 8 + 4x = 6$

$7x = 23$

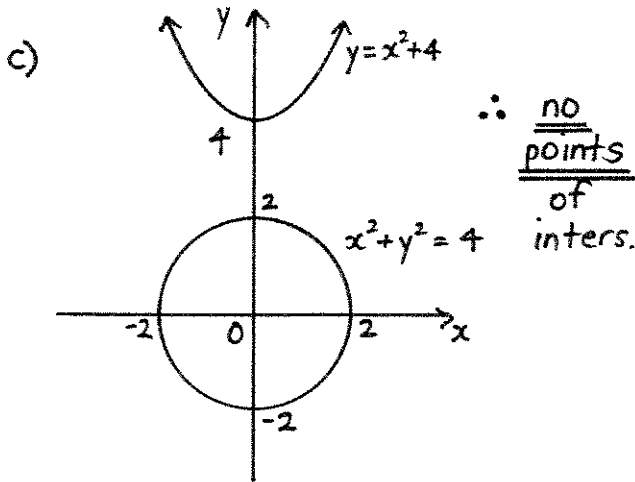
$\therefore x = \frac{23}{7}$

b) i. we can't evaluate the square root of a negative number

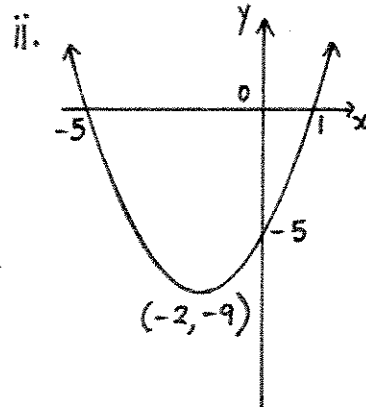
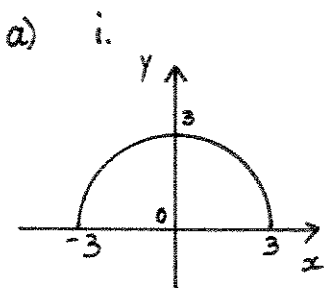
ii.  $10 - x \geq 10$

$10 \geq x$

$x \leq 10$



Question 6



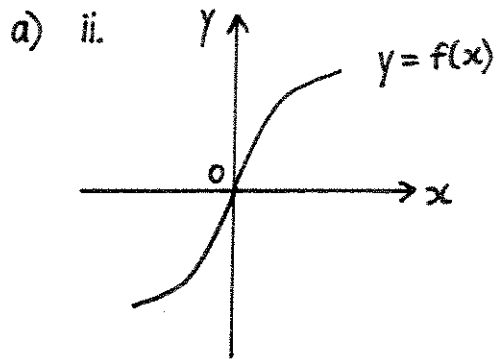
b)  $2x+1 = 3x-2$  or  $2x+1 = 2-3x$   
 $3 = x$  ✓  $5x = 1$   
 $x = \frac{1}{5}$

Check solutions!

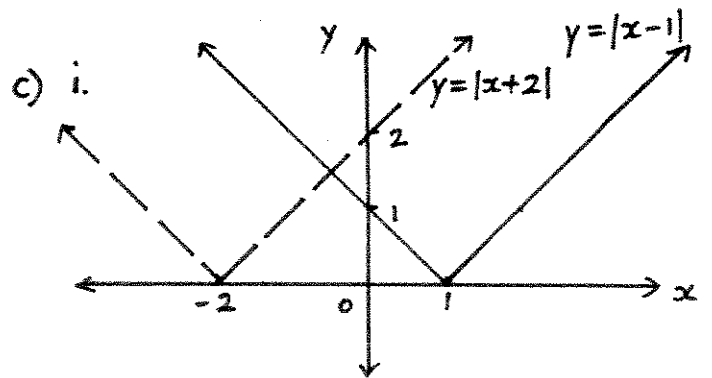
$\therefore$   $x = 3$  only

c)  $[3+(x+y)][3-(x+y)]$   
 $= \underline{\underline{(3+x+y)(3-x-y)}}$

Question 7



b)  $2x^2 + x = 2$   
 $2x^2 + x - 2 = 0$   
 $x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 2 \cdot -2}}{2 \cdot 2}$   
 $\therefore x = \underline{\underline{\frac{-1 \pm \sqrt{17}}{4}}}$



ii.  $x = -\frac{1}{2}$

### Question 8

a)  $x \times x < x + x$

$$x^2 < 2x$$

$$x^2 - 2x < 0$$

$$x(x - 2) < 0$$



$$\therefore \underline{\underline{0 < x < 2}}$$

b)  $y = 1 + \frac{1}{x}$

i.  $\underline{\underline{x = 0}}$

ii. let  $y = 0$   
 $0 = 1 + \frac{1}{x}$

$$\underline{\underline{x = -1}}$$

iii.  $\underline{\underline{y = 1}}$

iv.

