

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 $b = 18$

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

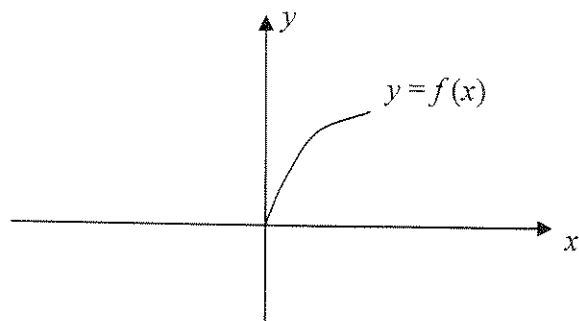
- a) Solve $\frac{x-3}{2} - \frac{4-2x}{3} = 1$ (3)
- b) Consider the function $y = \sqrt{10-x}$
- i) Explain why the domain of this function is restricted. (1)
- ii) Hence state the natural domain of $y = \sqrt{10-x}$ (1)
- c) How many points of intersection have the graphs of $x^2 + y^2 = 4$ and $y = x^2 + 4$? (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 5.5×10^4

b) 5.32×10^{-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 $1 - 2x = -5$
 $2x = -4$ $2x = 6$

$\therefore \underline{\underline{x = -2}}$ $x = 3$

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

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

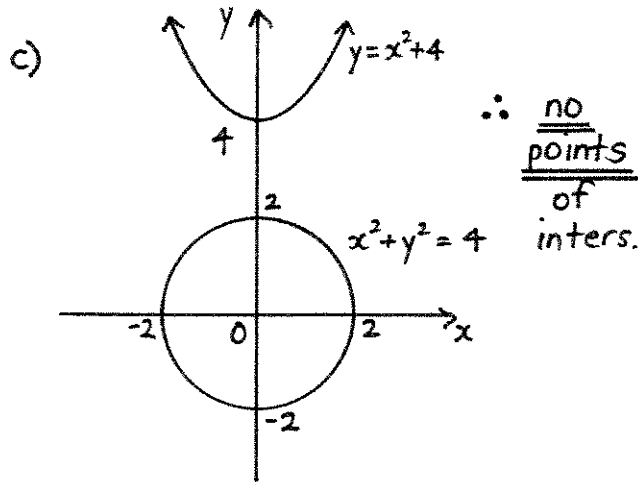
Check solutions!

$\therefore \underline{\underline{x = 3}}$ only

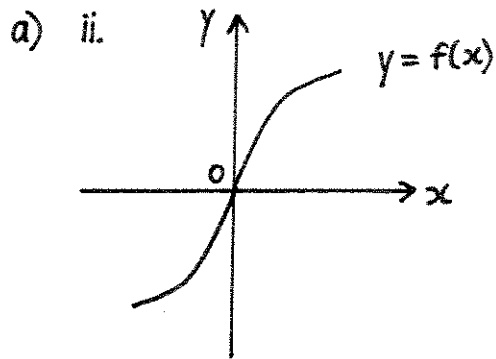
c) $[3+(x+y)][3-(x+y)]$
 $= \underline{\underline{(3+x+y)(3-x-y)}}$

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

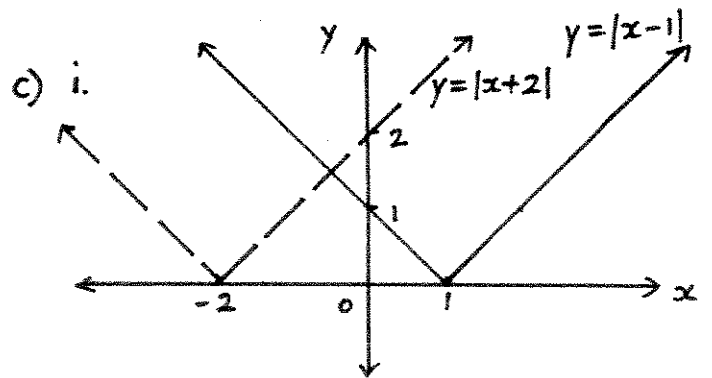
ii. $10-x \geq 10$
 $10 \geq x$
 $\underline{\underline{x \leq 10}}$



Question 7

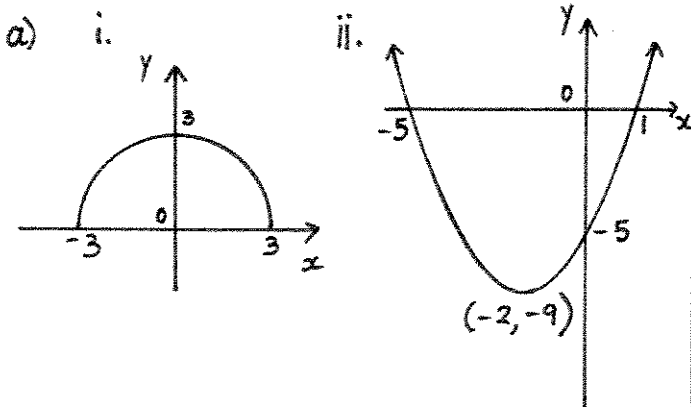


b) $2x^2 + x = 2$
 $2x^2 + x - 2 = 0$
 $x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 2 \cdot -2}}{2 \cdot 2}$
 $\therefore x = \underline{\underline{\frac{-1 \pm \sqrt{17}}{4}}}$



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

Question 6



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.

