

Section I**8 marks**

Use the multiple-choice answer sheet for Questions 1 – 8

QUESTION 1

The number 0.003489 written in scientific notation to 2 significant figures is:

- A. 3.489×10^{-3} B. 34.89×10^{-4}
C. 35×10^{-4} D. 3.5×10^{-3}

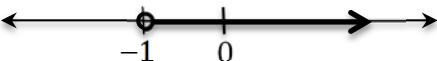
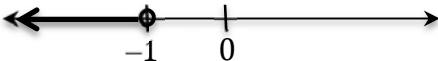
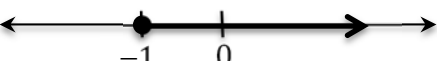
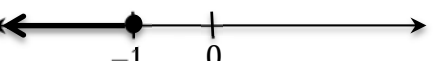
QUESTION 2The expanded version of $(2x - 1)^2$ is:

- A. $4x^2 - 4x + 1$ B. $4x^2 - 1$
C. $2x^2 + 1$ D. $4x^2 - 4x - 1$

QUESTION 3Expressed with a rational denominator, $\frac{2}{3\sqrt{3}}$ would be written:

- A. $\frac{\sqrt{6}}{3}$ B. $\frac{2\sqrt{3}}{27}$
C. $\frac{2\sqrt{3}}{9}$ D. $\frac{2\sqrt{3}}{3}$

QUESTION 4The solution to the inequation $1 - 2x < 3$ is represented on the number line as:

- A.  B. 
C.  D. 

QUESTION 5

$\left(-2\frac{2}{5}\right)^{-1}$ is the same as:

- A. $2\frac{2}{5}$ B. $\frac{5}{12}$
C. $-\frac{5}{4}$ D. $-\frac{5}{12}$

QUESTION 6

$3 - |3 - 7|$ is equal to:

- A. 7 B. -1
C. -7 D. 1

QUESTION 7

To complete the square on the expression $x^2 - 16x$ you would need to add:

- A. 4 B. 16
C. 64 D. 256

QUESTION 8

If $T = \frac{m_1 - m_2}{1 - m_1 m_2}$ find the value of m_2 when $T = -4\frac{1}{2}$ and $m_1 = -\frac{1}{2}$:

- A. $1\frac{3}{13}$ B. $-3\frac{1}{5}$
C. $1\frac{3}{5}$ D. $-1\frac{1}{15}$

Section II**72 marks**

Start each question in a separate booklet for Questions 1 – 8

QUESTION 9	(10 Marks)	(Start a new page)	Marks
(a)	Convert $0.04\dot{5}$ to a fraction in its simplest terms		2
(b)	Write $y^{\frac{3}{5}}$ without fractional indices		1
(c)	Simplify		
(i)	$\sqrt{18}$		1
(ii)	$2\sqrt{5} + 3 - 3\sqrt{5} + 1$		1
(iii)	$3\sqrt{2} \times 5\sqrt{14}$		2
(iv)	$\frac{5\sqrt{6}}{\sqrt{3}}$		1
(d)	Express $\frac{\sqrt{2}}{\sqrt{5} - \sqrt{2}}$ with a rational denominator		2

QUESTION 10 (13 Marks) **(Start a new page)**

(a)	Simplify		
(i)	$14ab^2 \div 28ab$		2
(ii)	$-2st^3 \times -5st^6$		2
(b)	Factorise fully		
(i)	$b^2 - 25$		1
(ii)	$ab + 7a - 4b - 28$		1
(iii)	$w^2 - 7w + 10$		1
(iv)	$8x^2 + 31x + 21$		2
(v)	$27t^3 + 125$		1
(vi)	$2x^3 - 2x^2 - 2x + 2$		3

QUESTION 11 (12 Marks) **(Start a new page)** **Marks**

(a) Simplify

(i) $\frac{4a-2b}{4}$ **1**

(ii) $\frac{(a+b)(a-b)}{3ab} \times \frac{9a}{(a-b)^2}$ **2**

(b) Express as a single fraction in simplest terms

(i) $\frac{n}{3} - \frac{n}{4}$ **2**

(ii) $\frac{2}{3ab} + \frac{1}{9a}$ **2**

(iii) $\frac{y}{4-y^2} + \frac{y-1}{6+5y+y^2}$ **3**

(iv) $\frac{a^3-b^3}{a-b} \div \frac{a^2+ab+b^2}{a+b} \div \frac{1}{a^2+2ab+b^2}$ **2**

QUESTION 12 (11 Marks) **(Start a new page)**

Solve for x:

(a) $\frac{2x-1}{3} - 5 = \frac{x}{6}$ **2**

(b) $|x+2| \leq 3$ **3**

(c) $|2x-1| = x+3$ **3**

(d) $x^{\frac{2}{5}} = \frac{9}{4}$ **1**

(e) $64^{x+3} = 4^x$ **2**

QUESTION 13 (13 Marks) **(Start a new page)** **Marks**

- (a) Solve for x giving exact solutions:
- (i) $(x-4)^2 = 5$ **2**
- (ii) $3x(2x-1) > 0$ **2**
- (iii) $2x^2 + x = 3$ **2**
- (iv) $\frac{5x+7}{x-1} = 3x+2$ **2**
- (b) Solve simultaneously:
- (i) $3x - y = 5$
 $5x + 3y = -8$ **2**
- (ii) $x - y = 1$
 $xy = 2$ **3**

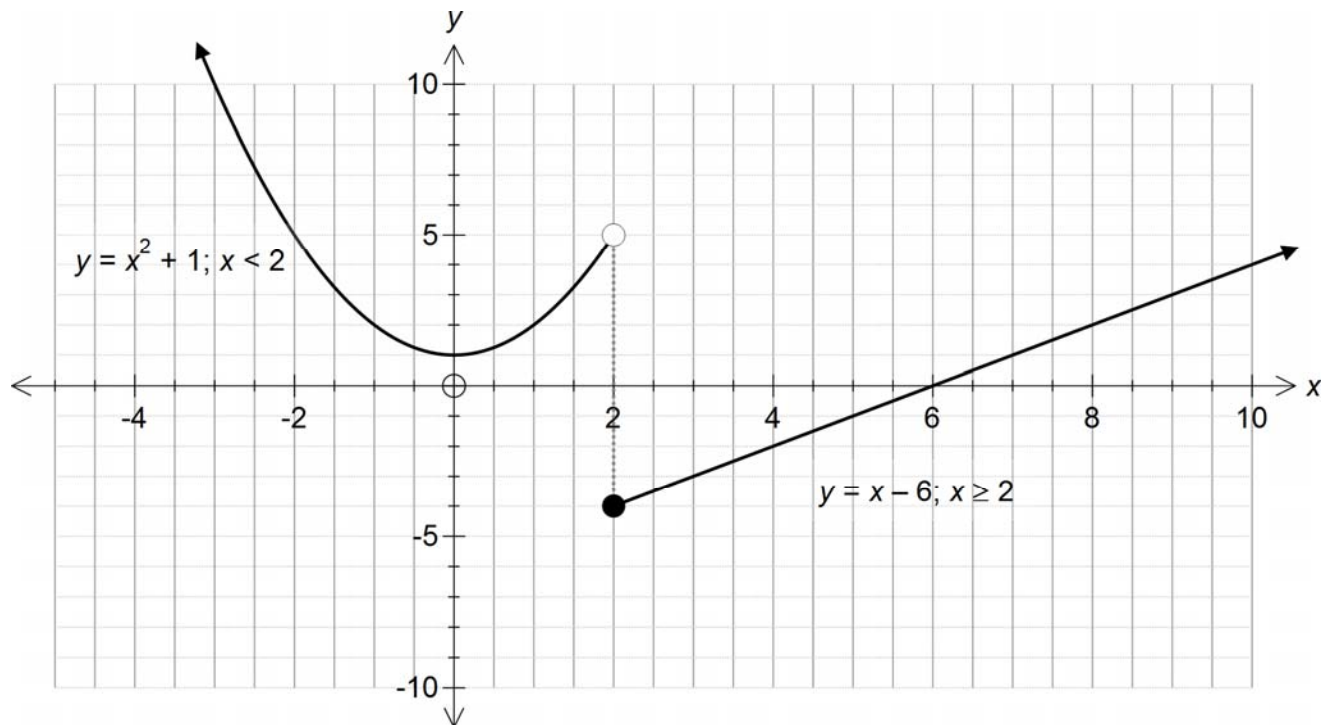
QUESTION 14 (13 Marks) **(Start a new page)**

- (a) Is the following set of points a function? $\{(1,1),(2,2)(3,5)(3,9)\}$ **1**
- (b) If $f(x) = \begin{cases} x+1 & x \leq 3 \\ x^2 & x > 3 \end{cases}$, find $f(-3)$ **1**
- (c) Consider the function $f(x) = (x-3)^2$
- (i) Find the x and y intercepts. **2**
- (ii) Write down the domain and range clearly indicating which is which. **2**
- (d) **Show** whether the function given by $f(x) = \frac{x}{x^2-1}$ is odd, even or neither. **2**

Question 14 continues page 6.

QUESTION 14 continued.**Marks**

- (e) (i) Give the domain and range for the graph below. **2**
(ii) Is the graph a function? **1**



- (f) Draw a neat graph of $3x - 2y - 12 = 0$ clearly marking on any intercepts with the axes. **2**

END OF EXAM

2013 Solutions Unit 11.

1) D

2) A

3) C

4) A

5) D

6) B

7) C

8) B

Section 2.

Question 9.

a) $0.0\dot{4}\dot{5}$

let $x = 0.0454545\dots$

$$100x = 4.545455$$

$$99x = 4.5$$

$$x = \frac{4.5}{99}$$

$$= \frac{45}{990}$$

$$= \frac{1}{22}$$

b) $y^{3/5} = \sqrt[5]{y^3}$

c) i) $\sqrt{18} = 3\sqrt{2}$

ii) $2\sqrt{5} + 3 - 3\sqrt{5} + 1$
 $= 4 - \sqrt{5}$

iv) $3\sqrt{2} \times 5\sqrt{14}$
 $= 15\sqrt{28}$
 $= 30\sqrt{7}$

$$\text{iv) } \frac{5\sqrt{6}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{5\sqrt{18}}{3}$$

$$= \frac{15\sqrt{2}}{3}$$

$$= 5\sqrt{2}$$

$$\text{d) } \frac{\sqrt{2}}{\sqrt{5}-\sqrt{2}} \times \frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}+\sqrt{2}}$$

$$= \frac{\sqrt{10} + 2}{5 - 2}$$

$$= \frac{\sqrt{10} + 2}{3}$$

Question 10

$$\text{a) i) } 14ab^2 \div 28ab$$

$$= \frac{b}{2}$$

$$\frac{14ab^2}{28ab}$$

$$\text{ii) } -2st^3 \times -5st^6$$
$$= 10s^2t^9$$

$$\text{b) i) } b^2 - 25$$
$$= (b-5)(b+5)$$

$$\text{ii) } ab + 7a - 4b - 28$$

$$= a(b+7) - 4(b+7)$$

$$= (a-4)(b+7)$$

$$\text{iii) } w^2 - 7w + 10 \\ = (w-5)(w-2)$$

$$\text{iv) } 8x^2 + 31x + 21 \\ x = \frac{-31 \pm \sqrt{961 - 4(21)(8)}}{16} \\ = \frac{-31 \pm \sqrt{289}}{16} \\ = \frac{-13 \pm 17}{6}$$

$$x = -30/6 \text{ OR } 4/6 \\ = -5 \text{ OR } 2/3$$

$$\therefore 8x^2 + 31x + 21 = (x+5)(3x-2)$$

$$\text{v) } 27t^3 + 125 \\ = (3t+5)(9t^2 - 15t + 25)$$

$$\text{vi) } 2x^3 - 2x^2 - 2x + 2 \\ = 2(x^3 - x^2 - x + 1) \\ = 2(x^2(x-1) - 1(x-1)) \\ = 2(x^2-1)(x-1) \\ = 2(x+1)(x-1)(x-1) \\ = 2(x+1)(x-1)^2$$

Qn 11

$$\text{a) } \frac{4a-2b}{4}$$

$$= \frac{2(2a-b)}{4} \\ = \frac{2a-b}{2}$$

$$\text{a) ii) } \frac{(a+b)(a-b)}{\cancel{3}b} \times \frac{\cancel{3}9a}{(a-b)^2}$$

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

$$\text{b) i) } \frac{n}{3} - \frac{n}{4}$$

$$= \frac{4n - 3n}{12}$$

$$= \frac{n}{12}$$

$$\text{ii) } \frac{2}{3ab} + \frac{1}{9a}$$

$$= \frac{6+b}{9ab}$$

$$\text{iii) } \frac{y}{4-y^2} + \frac{y-1}{6+5y+y^2}$$

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

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

$$= \frac{y^2 + 3y + 2y - y^2 - 2 + y}{(2-y)(y+3)(y+2)}$$

$$= \frac{6y - 2}{(2-y)(y+3)(y+2)}$$

$$\text{iv) } \frac{a^3 - b^3}{a - b} \div \frac{a^2 + ab + b^2}{a + b} \div \frac{1}{a^2 + 2ab + b^2}$$

$$= \left(\frac{(a-b)(a^2 + ab + b^2)}{a-b} \div \frac{a^2 + ab + b^2}{a+b} \right) \times \frac{(a+b)^2}{1}$$

$$= \frac{a-b(a^2 + ab + b^2)}{a-b} \times \frac{a+b}{a^2 + ab + b^2} \times (a+b)^2$$

$$= (a+b)^3$$

Question 12.

$$\text{a) } \frac{2x-1}{3} - 5 = \frac{x}{6}$$

$$2(2x-1) - 30 = x$$

$$4x - 2 - 30 = x$$

$$3x = 32$$

$$x = \frac{32}{3}$$

$$\text{b) } |x+2| \leq 3$$

$$x+2 \leq 3$$

$$x \leq 1$$

$$\text{OR. } -(x+2) \leq 3$$

$$-x-2 \leq 3$$

$$-x \leq 5$$

$$x \geq -5$$

try $x=0$

$$|0+2| \leq 3 \checkmark$$

$$-5 \leq x \leq 1$$

$$c) |2x-1| = x+3$$

$$2x-1 = x+3$$

$$x = 4$$

$$\text{OR } -(2x-1) = x+3$$

$$-2x+1 = x+3$$

$$-3x = 2$$

$$x = -2/3$$

$$d) \text{ try } |2(4)-1| = 4+3$$

✓

$$|2(-2/3)-1| = -2/3+3$$

$$|-8/3-1| = 2\frac{1}{3}$$

$$-1\frac{1}{3} = 7\frac{1}{3} \times$$

∴ only $x=4$

$$d) x^{2/5} = \frac{9}{4}$$

$$x^{2/5} = \left(\frac{3}{2}\right)^2$$

$$x = \left(\left(\frac{3}{2}\right)^2\right)^{5/2}$$

$$x = \frac{3^5}{2^5}$$

$$e) 64^{x+3} = 4^x$$

$$4^{3(x+3)} = 4^x$$

$$3(x+3) = x$$

$$3x+9 = x$$

$$2x = -9$$

$$x = -\frac{9}{2}$$

Question 13.

a i) $(x-4)^2 = 5$
 $\sqrt{(x-4)^2} = \pm\sqrt{5}$
 $x-4 = \pm\sqrt{5}$
 $x = 4 \pm \sqrt{5}$

ii) $3x(2x-1) > 0$

$\therefore x > 0 \wedge 2x-1 > 0$ try $x = \frac{1}{4} \rightarrow -3/8x$
 $2x > 1$
 $x > \frac{1}{2}$

$\therefore x > \frac{1}{2}$

iii) $2x^2 + x = 3$

$2x^2 + x - 3 = 0$

$\frac{2x^2 + x - 6}{2} = 0$

$\frac{(2x+6)(2x-1)}{2} = 0$

$(x+3)(2x-1) = 0$

iv) $\frac{5x+7}{x-1} = 3x+2$

$5x+7 = (3x+2)(x-1)$

$5x+7 = 3x^2 - 3x + 2x - 2$

$5x+7 = 3x^2 - 5x - 2$

$3x^2 - 10x - 9 = 0$

$x = \frac{10 \pm \sqrt{100 - 4(-9)(3)}}{6}$

$= \frac{10 \pm \sqrt{208}}{6}$

$\therefore x = \frac{10 \pm 4\sqrt{13}}{6} = \frac{5 \pm 2\sqrt{13}}{3}$

13 cont

$$\begin{aligned} \text{b) i) } & 3x - y = 5 & \textcircled{1} \\ & 5x + 3y = -8 & \textcircled{2} \end{aligned}$$

$$\begin{aligned} \text{From } \textcircled{1} & y = 3x - 5 \\ & 5x + 3(3x - 5) = -8 \\ & 5x + 9x - 15 = -8 \\ & 14x = 7 \\ & x = \frac{1}{2} \end{aligned}$$

$$\begin{aligned} y &= 3\left(\frac{1}{2}\right) - 5 \\ &= -\frac{7}{2} \end{aligned}$$

$$\therefore x = \frac{1}{2}$$

$$y = -\frac{7}{2}$$

$$\text{check } 5\left(\frac{1}{2}\right) + 3\left(-\frac{7}{2}\right) = -8 \quad \checkmark$$

$$\begin{aligned} \text{ii) } & x - y = 1 & \textcircled{1} \\ & xy = 2 & \textcircled{2} \end{aligned}$$

$$\begin{aligned} \text{From } \textcircled{1} & x = 1 + y \\ \text{Subst into } \textcircled{2} & \end{aligned}$$

$$(1+y)(y) = 2$$

$$y^2 + y = 2$$

$$y^2 + y - 2 = 0$$

$$(y-1)(y+2) = 0$$

$$\therefore y = 1 \text{ or } -2$$

$$x = 1 + y$$

$$x = 2 \text{ or } -1$$

$x = 2$	or	$x = -1$
$y = 1$		$y = -2$

$$\text{check } xy = 2:$$

$$(2 \times 1) \text{ or } (-1 \times -2) \& 2 - 1 = 1 \text{ or } -1 - (-2) = 1 \quad \checkmark$$