



**GIRRAWEEEN HIGH SCHOOL  
YEAR 11 - TASK 1 (2009)  
MATHEMATICS**

*Time allowed – 90 min*

- Start each question on a *new* sheet of paper.

**Question 1 (16 marks)**

- (a) Find  $\frac{\sqrt{34 \div 5.9}}{21 - 4.7}$  correct to 3 decimal places. 1
- (b) Evaluate  $\sqrt[3]{\frac{73.1}{0.2}}$  correct to 2 significant figures. 1
- (c) Write 0.01072 in scientific notation. 1
- (d) Fully simplify  $\sqrt{245}$ . 2
- (e) If  $\sqrt{12} - \sqrt{3} = x\sqrt{3}$ , find the value of  $x$ . 2
- (f) Which of the following  $\pi, \sqrt{1}, -\sqrt{9}, \sqrt{3}, 2^{-1}, 5^{\frac{1}{2}}, 8^{\frac{1}{3}}$  are rational numbers. 3
- (g) Express the following as a fraction in simplest form.
- (i)  $0.38\dot{4}$  3
- (ii)  $6.\dot{2}4\dot{7}$  3

**Question 2 (24 marks)**

- (a) Simplify.
- (i)  $\sqrt{50} - \sqrt{32}$  2
- (ii)  $2\sqrt{3} + \sqrt{27} - \sqrt{243}$  2
- (iii)  $\frac{5\sqrt{2} \times 6\sqrt{10}}{3\sqrt{5}}$  3
- (b) Expand and simplify.
- (i)  $4\sqrt{3}(3\sqrt{6} + 2\sqrt{12})$  2
- (ii)  $(5\sqrt{2} - 3)^2$  3

(c) Express with a rational denominator.

(i)  $\frac{2\sqrt{3}}{\sqrt{7}}$  2

(ii)  $\frac{4}{2-\sqrt{5}}$  3

(iii)  $\frac{\sqrt{2}}{\sqrt{3}-4\sqrt{5}}$  3

(iv)  $\frac{7\sqrt{5}-1}{7\sqrt{5}+1}$  4

**Question 3 (22 marks)**

(a) Expand and simplify

(i)  $3a^2\left(2a - \frac{b^2}{a}\right) - 5a(b^2 + 3a)$  2

(ii)  $(3y^2 - 2)(3y^2 + 2)$  2

(iii)  $(x + 2)(x^2 - 2x + 4)$  2

(iv)  $(x + 2)(x - 4)^2$  3

(b) Factorise

(i)  $4m^2 - 25$  2

(ii)  $x^2 - 4xy - 60y^2$  2

(iii)  $2y^2 + 11y - 21$  3

(iv)  $64r^3 - 27$  3

(v)  $4 - 64a^4$  3

**Question 4 (19 marks)**

(a) Simplify

(i)  $\frac{3c}{4} - \frac{c}{6}$  2

(ii)  $\frac{1}{x-2} - \frac{1}{x}$  3

(iii)  $\frac{2}{x+3} + \frac{x}{x-2}$  3

(b) Simplify

(i)  $\frac{1-x}{x^2-1}$  3

(ii)  $\frac{x^3+4x^2-4x-16}{x^2+6x+8}$  4

(iii)  $\frac{a^2+b^2}{a+b} \div \frac{a^4-b^4}{a^2+2ab+b^2}$  4

**Question 5 (20 marks)**

(a) Solve

(i)  $28 = 12x - 5x$  2

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

(iii)  $\frac{9}{2x} = 4 - \frac{3}{x}$  3

(iv)  $4x^2 + 4x - 15 = 0$  4

(b) Complete the following

$x^2 + 14x + \dots = (x + \dots)^2$  2

(c) Solve by completing the square

$x^2 + 4x = 1$  4

(d) Solve by using the quadratic formula

$2x^2 + 4x - 7 = 0$  3

**Question 6 (13 marks)**

(a) Solve the following

(i)  $-2x \leq 4$  1

(ii)  $\frac{2x}{3} < x + 2$  2

(b) Solve simultaneously

(i)  $x + 2y = 10$   
 $x - y = 1$  3

(ii)  $5x + 2y = 11$   
 $x - 5y = 13$  3

(iii)  $y = x^2 + 3$   
 $y = 4x$  4

**Question 7 (16 marks)**

(a) Indicate whether each of the following relations is a **function** or **not a function**.  
 State its *domain*.

(i)  $x^2 + y^2 = 9$  2

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

(iii)  $y = \sqrt{\frac{1}{4} - x^2}$  2

(iv)  $y = -1 - x^2$  2

(b) Graph the function  $x - 3y - 3 = 0$ , including any intercepts. 3

(c) Graph the function  $y = x^2 - 10x - 11$ , including the vertex and intercepts. 5

Year 4 - TASK 1 (2009)  
MATHEMATICS.

Q1 a)  $0.147$  (1)

b)  $7.1$  (1)

c)  $1.072 \times 10^{-2}$  (1)

d)  $\sqrt{245} = \sqrt{49 \times 5}$   
 $= 7\sqrt{5}$  (2)

e)  $\sqrt{12} - \sqrt{3} = x\sqrt{3}$   
 $2\sqrt{3} - \sqrt{3} = x\sqrt{3}$   
 $1\sqrt{3} = x\sqrt{3}$   
 $\therefore x = 1$  (2)

f) RATIONAL  
 $\sqrt{1}, -\sqrt{9}, 2^{-1}, 8^{-\frac{1}{3}}$  (3)

g) i)  $x = 0.3844\dots$   
 $100x = 38.44\dots$   
 $1000x = 384.44\dots$   
 $\therefore 1000x - 100x = 384 - 38$   
 $900x = 346$   
 $x = \frac{346}{900} = \frac{173}{450}$  (3)

ii)  $x = 6.247247\dots$   
 $1000x = 6247.247247\dots$   
 $1000x - x = 6247 - 6$   
 $999x = 6241$   
 $x = \frac{6241}{999}$  (3)  $6 \frac{247}{999}$  (3)

Q2 a) i)  $\sqrt{50} - \sqrt{32}$   
 $= 5\sqrt{2} - 4\sqrt{2}$   
 $= \sqrt{2}$  (2)

ii)  $2\sqrt{3} + \sqrt{27} - \sqrt{243}$   
 $= 2\sqrt{3} + 3\sqrt{3} - 9\sqrt{3}$   
 $= -4\sqrt{3}$  (2)

iii)  $\frac{5\sqrt{2} \times 6\sqrt{10}}{3\sqrt{5}}$   
 $= \frac{30\sqrt{20}}{3\sqrt{5}}$   
 $= 10\sqrt{\frac{20}{5}}$   
 $= 10\sqrt{4}$   
 $= 20$  (3)

b) i)  $4\sqrt{3}(3\sqrt{6} + 2\sqrt{12})$   
 $= 12\sqrt{18} + 8\sqrt{36}$   
 $= 36\sqrt{2} + 48$  (2)

ii)  $(5\sqrt{2} - 3)^2$   
 $= 25(2) - 2(5\sqrt{2})(3) + 9$   
 $= 59 - 30\sqrt{2}$  (3)

c) i)  $\frac{2\sqrt{3}}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$   
 $= \frac{2\sqrt{21}}{7}$  (2)

$$c) ii) \frac{4}{2-\sqrt{5}} \times \frac{(2+\sqrt{5})}{(2+\sqrt{5})}$$

$$= \frac{8+4\sqrt{5}}{4-5}$$

$$= \frac{8+4\sqrt{5}}{-1}$$

$$= \underline{-8-4\sqrt{5}} \quad (3)$$

$$iii) \frac{\sqrt{2}}{\sqrt{3}-4\sqrt{5}} \times \frac{\sqrt{3+4\sqrt{5}}}{\sqrt{3+4\sqrt{5}}}$$

$$= \frac{\sqrt{6+4\sqrt{10}}}{3-16(5)}$$

$$= \frac{\sqrt{6+4\sqrt{10}}}{-77} \quad (3)$$

$$iv) \frac{7\sqrt{5}-1}{7\sqrt{5}+1} \times \frac{7\sqrt{5}-1}{7\sqrt{5}-1}$$

$$= \frac{49(5) - 2(7\sqrt{5})(1) + 1}{49(5) - 1}$$

$$= \frac{246 - 14\sqrt{5}}{244}$$

$$= \frac{123 - 7\sqrt{5}}{122} \quad (4)$$

$$(Q3) a) i) 3a^2 \left(2a - \frac{b^2}{a}\right) - 5a(b^2 + 3a)$$

$$= 6a^3 - 3ab^2 - 5ab^2 - 15a^2$$

$$= 6a^3 - 8ab^2 - 15a^2$$

$$= \underline{a(6a^2 - 8b^2 - 15a)} \quad (2)$$

$$a) ii) (3y^2-2)(3y^2+2)$$

$$= \underline{9y^4 - 4} \quad (2)$$

$$iii) (x+2)(x^2-2x+4)$$

$$= x^3 - 2x^2 + 4x + 2x^2 - 4x + 8$$

$$= \underline{x^3 + 8} \quad (2)$$

$$iv) (x+2)(x-4)^2$$

$$= (x+2)(x^2-8x+16)$$

$$= x^3 - 8x^2 + 16x + 2x^2 - 16x + 32$$

$$= \underline{x^3 - 6x^2 + 32} \quad (3)$$

$$b) i) 4m^2 - 25$$

$$= \underline{(2m-5)(2m+5)} \quad (2)$$

$$ii) x^2 - 4xy - 60y^2$$

$$= \underline{(x-10y)(x+6y)} \quad (2)$$

$$iii) 2y^2 + 11y - 21 \quad \frac{+42}{\text{OR}}$$

$$= 2y^2 + 14y - 3y - 21$$

$$= 2y(y+7) - 3(y+7)$$

$$= \underline{(y+7)(2y-3)} \quad (3)$$

$$iv) 64r^3 - 27$$

$$= \underline{(4r-3)(16r^2+12r+9)} \quad (3)$$

$$v) 4 - 64a^4$$

$$= 4(1 - 16a^4)$$

$$= 4(1-4a^2)(1+4a^2)$$

$$= 4(1-2a)(1+2a)(1+4a^2) \quad (3)$$

$$\textcircled{Q4} \text{ a) i) } \frac{3c}{4} - \frac{c}{6}$$

$$= \frac{9c}{12} - \frac{2c}{12}$$

$$= \frac{7c}{12} \quad \textcircled{2}$$

$$\text{ii) } \frac{1}{x-2} - \frac{1}{x}$$

$$= \frac{x}{x(x-2)} - \frac{(x-2)}{x(x-2)}$$

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

$$= \frac{2}{x(x-2)} \quad \textcircled{3}$$

$$\text{iii) } \frac{2}{x+3} + \frac{x}{x-2}$$

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

$$= \frac{2x-4 + x^2+3x}{(x+3)(x-2)}$$

$$= \frac{x^2+5x-4}{(x+3)(x-2)} \quad \textcircled{3}$$

$$\text{b) i) } \frac{1-x}{x^2-1}$$

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

$$= \frac{-1}{x+1} \quad \textcircled{3}$$

$$\text{ii) } \frac{x^3+4x^2-4x-16}{x^2+6x+8}$$

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

$$= \frac{(x+4)(x^2-4)}{(x+4)(x+2)} = \frac{(x-2)(x+2)}{(x+2)} \quad \textcircled{4}$$

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

$$\text{b) iii) } \frac{a^2+b^2}{a+b} \div \frac{a^4-b^4}{a^2+2ab+b^2}$$

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

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

$$= \frac{1}{a-b} \quad \textcircled{4}$$

$$\textcircled{Q5} \text{ a) i) } 28 = 12x - 5x$$

$$7x = 28$$

$$x = 4 \quad \textcircled{2}$$

$$\text{ii) } (2x-1)(x+3) = 0$$

$$2x-1=0 \quad \text{or} \quad x+3=0$$

$$2x=1$$

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

$$x = -3$$

$\textcircled{2}$

$$\text{iii) } \frac{9}{2x} = 4 - \frac{3}{x}$$

$$9 = 8x - 6$$

$$15 = 8x$$

$$x = \frac{15}{8} \quad \text{or} \quad \frac{7}{8} \quad \textcircled{3}$$

$$\text{iv) } 4x^2+4x-15=0 \quad \text{or} \quad 2x \times -3$$

$$2x \times +5$$

$$4x^2+10x-6x-15=0$$

$$2x(2x+5) - 3(2x+5) = 0$$

$$(2x+5)(2x-3) = 0$$

$$\therefore x = -\frac{5}{2}, \quad x = \frac{3}{2} \quad \textcircled{4}$$

$$\text{b) } x^2+14x + \left(\frac{14}{2}\right)^2 = \left(x + \frac{14}{2}\right)^2$$

$$\therefore \quad \textcircled{7}^2$$

$$\textcircled{7} \quad \textcircled{2}$$

$$x^2+14x + \underline{49} = (x+7)^2$$

$$\textcircled{Q5} \text{ c) } x^2 + 4x = 1$$

$$x^2 + 4x + 4 = 1 + 4$$

$$(x+2)^2 = 5$$

$$x+2 = \pm\sqrt{5}$$

$$\underline{x = -2 \pm \sqrt{5}}$$

④

$$\text{d) } 2x^2 + 4x - 7 = 0$$

$$\therefore x = \frac{-4 \pm \sqrt{4^2 - 4(2)(-7)}}{2(2)}$$

$$= \frac{-4 \pm \sqrt{16 + 56}}{4}$$

$$= \frac{-4 \pm \sqrt{72}}{4}$$

$$= \frac{-4 \pm 6\sqrt{2}}{4}$$

$$\underline{x = \frac{-2 \pm 3\sqrt{2}}{2}}$$

③

$$\textcircled{Q6} \text{ a) i) } -2x \leq 4$$

$$\underline{x \geq -2}$$

①

$$\text{ii) } \frac{2x}{3} < x + 2$$

$$2x < 3x + 6$$

$$-6 < x$$

$$\underline{x > -6}$$

②

$$\text{b) i) } \begin{aligned} x + 2y &= 10 & \textcircled{1} \\ x - y &= 1 & \textcircled{2} \end{aligned}$$

$$\textcircled{1} - \textcircled{2} \quad 3y = 9$$

$$\underline{y = 3}$$

sub  $y=3$  into  $\textcircled{2}$

$$x - 3 = 1$$

$$\underline{x = 4}$$

$\therefore (4, 3)$

③

$$\text{ii) } 5x + 2y = 11 \quad \textcircled{1}$$

$$x - 5y = 13 \quad \textcircled{2}$$

$$x = 5y + 13 \quad \textcircled{3}$$

sub  $\textcircled{3}$  into  $\textcircled{1}$

$$5(5y + 13) + 2y = 11$$

$$25y + 65 + 2y = 11$$

$$27y = -54$$

$$\underline{y = -2}$$

sub  $y = -2$  into  $\textcircled{2}$

$$x - 5(-2) = 13$$

$$x + 10 = 13$$

$$\underline{x = 3}$$

$(3, -2)$

③



Q6) b) iii)  $y = x^2 + 3$  (1)  
 $y = 4x$  (2)

sub (1) into (2)  $4x = x^2 + 3$

$x^2 - 4x + 3 = 0$

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

$\therefore x = 1, 3$

sub  $x=1$  into (2)

$y = 4(1)$   
 $y = 4$

$\therefore (1, 4)$

sub  $x=3$  into (2)

$y = 4(3)$   
 $y = 12$

$(3, 12)$  (4)

c)  $y = x^2 - 10x - 11$

$y = (x-11)(x+1)$

(y-int)  $y = 0^2 - 10(0) - 11$

$y = -11$

(x-int)  $0 = (x-11)(x+1)$

$\therefore x = 11, -1$

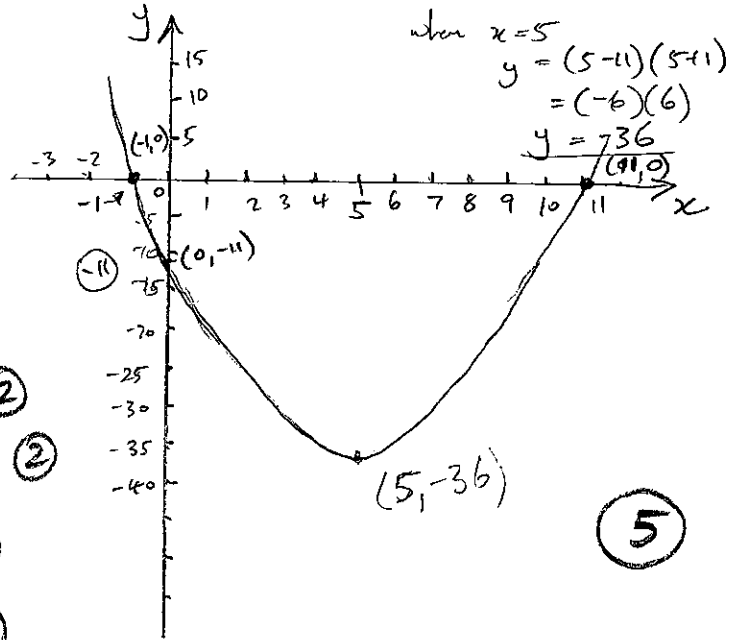
Axis of symmetry

$x = \frac{-b}{2a}$

$x = \frac{-(-10)}{2(1)}$

$x = 5$

or Avg. of x-int.



Q7) a) i) NOT a function;  $D: -3 \leq x \leq 3$  (2)

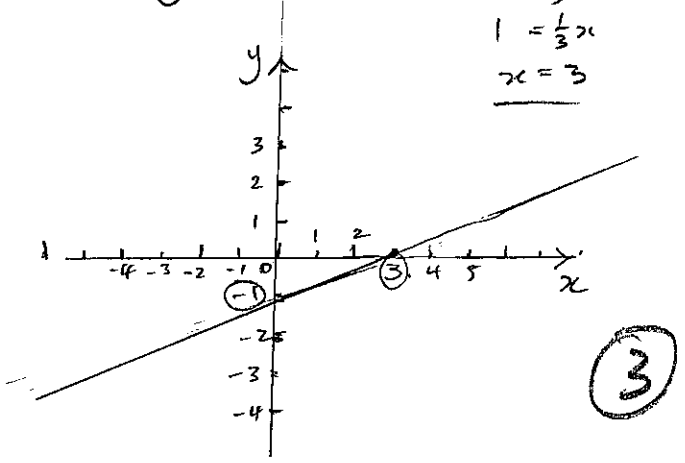
ii) Function;  $D: \text{all real } x, x \neq 3$  (2)

iii) Function;  $D: -\frac{1}{2} \leq x \leq \frac{1}{2}$  (2)

iv) Function;  $D: \text{all real } x$ . (2)

b)  $x - 3y - 3 = 0$  (y-int)  
 $y = \frac{1}{3}(0) - 1$   
 $y = -1$

$3y = x - 3$   
 $y = \frac{1}{3}x - 1$  (x-int)  
 $0 = \frac{1}{3}x - 1$   
 $1 = \frac{1}{3}x$   
 $x = 3$



(3)