



FINAL MARK

**GIRRAWEEEN HIGH SCHOOL
MATHEMATICS
PRELIMINARY ASSESSMENT Task 1 2010
ANSWERS COVER SHEET**

Name: _____

QUESTION	MARK	P2	P3	P4	P5	P6	P7	P8
Q1	/23		✓	✓				
Total	/23							
Q2	/16		✓	✓				
Total	/16							
Q3	/12		✓	✓				
Total	/12							
Q4	/17		✓	✓				
Total	/17							
Q5	/15		✓	✓				
Total	/15							
Q6	/18				✓			
Total	/18							
TOTAL								
	/101		/83	/83	/18			

Preliminary Learning Outcomes Mathematics

- P1 demonstrates confidence in using mathematics to obtain realistic solutions to problems
- P2 provides reasoning to support conclusions which are appropriate to the context
- P3 performs routine arithmetic and algebraic manipulation involving surds, simple rational expressions and trigonometric identities
- P4 chooses and applies appropriate arithmetic, algebraic, graphical, trigonometric and geometric techniques
- P5 understands the concept of a function and the relationship between a function and its graph
- P6 relates the derivative of a function to the slope of its graph
- P7 determines the derivative of a function through routine application of the rules of differentiation
- P8 understands and uses the language and notation of calculus

Girraween High School

Year 11

Mathematics Task 1 2010

Instructions: *Attempt all questions.

*Write all answers on your own paper. Remember to start each of Questions 1, 2, 3, 4, 5 and 6 on a separate sheet of paper.

*Show all necessary working.

*Marks may be deducted for careless or badly arranged work.

Time allowed: 90 minutes (45 minutes for each of Part A and Part B)

Part A (Time allowed: 45 minutes)

Question 1 (23 marks)

Marks

(a) Evaluate $\sqrt{\frac{31.6^2 \times 12.7^5}{3.62 + 0.71 \times 5}}$. Answer in scientific notation correct to

3 significant figures.

2

(b) Express $1.5\dot{7}0\dot{3}$ as a fraction in simplest form.

3

(c) If $p = 2.3$ and $q = \frac{-1}{7}$ find $\pi p^2 q$. Answer correct to 3 decimal

1

places.

(d) Simplify fully:

(i) $\sqrt{45}$

1

(ii) $2\sqrt{7} + \sqrt{28} - 3\sqrt{63}$

2

(iii) $\frac{2\sqrt{6} \times 5\sqrt{8}}{4\sqrt{2}}$

2

Question 1 (continued)**Marks**

(e) Expand and simplify:

(i) $2\sqrt{3}(5\sqrt{7} - \sqrt{5})$

1

(ii) $(6\sqrt{5} + 2\sqrt{2})^2$

2

(f) Express with a rational denominator:

(i) $\frac{4\sqrt{3}}{\sqrt{5}}$

1

(ii) $\frac{2\sqrt{5}-1}{5\sqrt{7}}$

2

(iii) $\frac{5\sqrt{3}+1}{2\sqrt{3}-4\sqrt{5}}$

3

(g) If $\frac{7-4\sqrt{3}}{7+4\sqrt{3}} = a + b\sqrt{3}$ where a and b are rational numbers,

3

find the value of a and b .**Question 2 (16 marks)**

(a) Expand and simplify:

(i) $3a(2a - 3b) - 5b(4a - b)$

2

(ii) $(2a + 3b)(2a - 3b)$

1

(iii) $(5x + 4y)(x + 3)$

1

(iv) $\left(7x - \frac{2}{x}\right)^2$

1

(v) $(2a + 3)(5a^2 - 6a + 1)$

2

Question 2 (continued)**Marks**

(b) Factorise FULLY:

(i) $2ab + 6a + b + 3$

2

(ii) $x^2 - 3x - 4$

1

(iii) $6x^2 + x - 2$

2

(iv) $8a^3 + 27$

1

(v) $x^6 - 64$

3

Question 3 (12 marks)

(a) Simplify FULLY:

(i) $\frac{5x}{6} + \frac{3x}{4}$

2

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

3

(b) Simplify fully:

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

2

(ii) $\frac{x^4-y^4}{x^2y-2xy^2+y^3}$

3

(iii) $\frac{x^2+x-6}{2x^2-3x+1} \times \frac{2x^2+3x-2}{x^2+3x}$

2

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Part B (Time allowed: 45 minutes)

Question 4 (17 marks)

Marks

(a) Solve:

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

2

(ii) $\frac{3x+1}{4} = 2 - \frac{x-9}{2}$

4

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

2

(iv) $3x^2 + x - 4 = 0$

2

(b) Complete: $x^2 - 10x + \underline{\quad} = (x - \underline{\quad})^2$

2

(c) Solve the equation $x^2 + 6x = 10$ by completing the square.

3

(d) Solve the equation $-2x^2 + x + 4 = 0$ using the quadratic

2

formula.

Question 5 (15 marks)

(a) Solve for x :

(i) $-3x \geq 6$

2

(ii) $2 - 3x < 16 + 4x$

2

Question 5 (continued)**Marks**

(b) Solve simultaneously:

$$\begin{aligned} \text{(i)} \quad & 3x + 5y = 18 \\ & 4x - 5y = -46 \end{aligned}$$

3

$$\begin{aligned} \text{(ii)} \quad & 2x + 3y = 7 \\ & 3x - 4y = 2 \end{aligned}$$

4

$$\begin{aligned} \text{(iii)} \quad & y = x + 6 \\ & 2x^2 + 2y^2 = 85 \end{aligned}$$

4**Question 6 (18 marks)**(a) State whether each of the following relations is a *function*

or not. Also state the domain of each relation.

$$\text{(i)} \quad y = 4x - 3$$

2

$$\text{(ii)} \quad x^2 + y^2 = 36$$

2

$$\text{(iii)} \quad y = \sqrt{x + 4}$$

2

$$\text{(iv)} \quad y = \sqrt{9 - x^2}$$

2

$$\text{(v)} \quad y = \frac{2}{2x+1}$$

2

Question 6 (continued)

Marks

(b) (i) Sketch the graph of $2x + 3y = 6$ showing the

3

intercepts with the co-ordinate axes.

(ii) Sketch the graph of $y = x^2 + 8x + 12$ showing

5

the vertex and the intercepts with the co-ordinate axes.



(23)

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— Solutions & Marking Scheme

$$Q.(1)(a) \sqrt{\frac{31.6^2 \times 12.7^5}{3.62 + 0.71 \times 5}}$$

$$= 6783.234126 \dots \quad | \quad \underline{\underline{2}}$$

$$= 6.78 \times 10^3 \text{ [3SF]} \quad | \quad \underline{\underline{1}}$$

(b) Let $x = 1.5703$

$$\begin{aligned} 10000x - 10x &= 15703.703 - 15.703 \quad | \\ 9990x &= 15688 \quad | \\ x &= \frac{15688}{9990} \quad | \quad \underline{\underline{3}} \\ &= \frac{212}{135} \quad | \\ &= 1 \frac{77}{135} \quad | \end{aligned}$$

(c) $\pi p q^2$

$$= \pi \times 2.3^2 \times \left(-\frac{1}{7}\right) \quad | \quad \underline{\underline{1}}$$

$$= -2.374146 \dots$$

$$= -2.37 \text{ [2DP]} \quad |$$

(d) (i) $\sqrt{45}$

$$= \sqrt{9 \times 5} \quad |$$

$$= 3\sqrt{5} \quad |$$

(ii) $2\sqrt{7} + \sqrt{28} - 3\sqrt{63}$

$$= 2\sqrt{7} + 2\sqrt{7} - 3 \times 3\sqrt{7} \quad |$$

$$= 4\sqrt{7} - 9\sqrt{7} \quad | \quad \underline{\underline{2}}$$

$$= -5\sqrt{7} \quad |$$

(iii) $\frac{2\sqrt{6} \times 5\sqrt{8}}{4\sqrt{2}}$

$$= \frac{2\sqrt{6} \times 10\sqrt{2}}{4\sqrt{2}} \quad \text{or} \quad \frac{20\sqrt{12}}{4\sqrt{2}} \quad | \quad \underline{\underline{2}}$$

$$= 5\sqrt{6} \quad | \quad \underline{\underline{1}}$$

$$= 5\sqrt{6} \quad |$$

$$\begin{aligned} \text{Q. (1)(e)(i)} & 2\sqrt{3}(5\sqrt{7} - \sqrt{5}) \\ & = 10\sqrt{21} - 2\sqrt{15}. \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(ii)} & (6\sqrt{5} + 2\sqrt{2})^2 \\ & = 180 + 24\sqrt{10} + 8 \quad \underline{2} \\ & = 188 + 24\sqrt{10} \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(f)(i)} & \frac{4\sqrt{3}}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} \\ & = \frac{4\sqrt{15}}{5} \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(ii)} & \frac{2\sqrt{5}-1}{5\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} \\ & = \frac{2\sqrt{35}-\sqrt{7}}{35}. \quad \underline{2} \end{aligned}$$

! if they use
 $\times 5\sqrt{7}$
& have to
simplify.

$$\begin{aligned} \text{(iii)} & \frac{5\sqrt{3}+1}{2\sqrt{3}-4\sqrt{5}} \times \frac{(2\sqrt{3}+4\sqrt{5})}{(2\sqrt{3}+4\sqrt{5})} \quad \underline{1} \end{aligned}$$

$$= \frac{30 + 20\sqrt{15} + 2\sqrt{3} + 4\sqrt{5}}{12 - 80} \quad \underline{3}$$

$$= \frac{-15 - 10\sqrt{15} - \sqrt{3} - 2\sqrt{5}}{34} \quad \underline{1}$$

$$\text{(g)} \quad \frac{7-4\sqrt{3}}{7+4\sqrt{3}} \times \frac{(7-4\sqrt{3})}{(7-4\sqrt{3})} \quad \underline{1}$$

$$\begin{aligned} & = \frac{49 - 56\sqrt{3} + 48}{49 - 48} \quad \underline{3} \\ & = 97 - 56\sqrt{3} \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{If } 97 - 56\sqrt{3} & = a + b\sqrt{3}, \\ a & = 97, b = -56. \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{Q. (2) (a) (i)} \quad & 3a(2a-3b) - 5b(4a-b) \\ & = 6a^2 - 9ab - 20ab + 5b^2 \quad | \quad \underline{2} \\ & = 6a^2 - 29ab + 5b^2 \quad | \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad & (2a+3b)(2a-3b) \\ & = 4a^2 - 9b^2 \quad | \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad & (5x+4y)(x+3) \\ & = 5x^2 + 15x + 4xy + 12y \quad | \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad & \left(7x - \frac{2}{x}\right)^2 \\ & = 49x^2 - 28 + \frac{4}{x^2} \quad | \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(v)} \quad & (7a+3)(5a^2-6a+1) \\ & = 10a^3 - 12a^2 + 2a + 15a^2 - 18a + 3 \quad | \quad \underline{2} \\ & = 10a^3 + 3a^2 - 16a + 3 \quad | \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(b) (i)} \quad & 2ab + 6a + b + 7 \\ & = 2a(b+3) + 1(b+3) \quad | \quad \underline{2} \\ & = (2a+1)(b+3) \quad | \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad & x^2 - 3x - 4 \\ & = (x-4)(x+1) \quad | \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad & 6x^2 + x - 2 \\ & = 6x^2 + 4x - 3x - 2 \\ & = 2x(3x+2) - 1(3x+2) \quad | \quad \underline{2} \\ & = (2x-1)(3x+2) \quad | \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad & 8a^3 + 27 \\ & = (2a+3)(4a^2 - 6a + 9) \quad | \quad \underline{1} \end{aligned}$$

$$\begin{aligned} \text{(v)} \quad & x^6 - 64 \\ & = (x^3 - 8)(x^3 + 8) \quad | \quad \underline{2} \\ & = (x-2)(x^2+2x+4)(x+2)(x^2-2x+4) \quad | \quad \underline{1} \end{aligned}$$

→ OR

$$\begin{aligned} & (x^2-4)(x^4+4x^2+16) \quad | \quad \underline{1} \\ & = (x-2)(x+2)(x^4+4x^2+16) \quad | \quad \underline{1} \\ & = (x-2)(x+2)(x^4+8x^2+16-4x^2) \\ & = (x-2)(x+2)(x^2+4)^2 - 4x^2 \quad | \quad \underline{1} \\ & = (x-2)(x+2)(x^2-2x+4)(x^2+2x+4) \quad | \quad \underline{1} \end{aligned}$$

(12) Y11 Task 1 210 Solutions: p. 4

Q.(3)(a)(i) $\frac{5x}{6} + \frac{3x}{4}$

$= \frac{10x}{12} + \frac{9x}{12}$ |

$= \frac{19x}{12}$ | 2

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

$= \frac{3x(5x+2) - 4x(2x-3)}{(2x-3)(5x+2)}$ |

$= \frac{15x^2 + 6x - 8x^2 + 12x}{(2x-3)(5x+2)}$ | 3

$= \frac{7x^2 + 18x}{(2x-3)(5x+2)}$ |

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

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

$= x-2$ | 2

(ii) $\frac{x^4-y^4}{x^2y-2xy^2+y^3}$

$= \frac{(x^2-y^2)(x^2+y^2)}{y(x^2-2xy+y^2)}$ |

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

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

(iii) $\frac{x^2+x-6}{2x^2-3x+1} \times \frac{2x^2+3x-2}{x^2+3x}$

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

$= \frac{(x-2)(x+2)}{x(x-1)}$ | or $= \frac{x^2-4}{x^2-x}$

FULL MARKS TO HERE.

Note: Give 1 mark for some factorisations right, cancelling & general right idea.

Solutions & Marking Scheme:

Q. (4)(a)(i) $3x+2 = 5-3x$ $+3x-2$ | 2
 $6x = 3$
 $x = \frac{1}{2}$ |

(ii) $\frac{3x+1}{4} = 2 - \frac{x-9}{2}$
 $\times 4$ by 4:

$3x+1 = 8 - 2(x-9)$ |

$3x+1 = 8 - 2x + 18$

$3x+1 = 26 - 2x$ |

$5x = 25$ $+2x-1$ | 4

$x = 5$ |

(iii) $(3x+2)(2x-1) = 0$ | 2
 $x = -\frac{2}{3}$ or $x = \frac{1}{2}$

(iv) $3x^2 + x - 4 = 0$

$(x-1)(3x+4) = 0$ | 2

$x=1$ or $x = -\frac{4}{3}$ |

(b) $x^2 - 10x + 25 = (x-5)^2$ | 2

(c) $x^2 + 6x = 10$

$x^2 + 6x + 9 = 19$

$(x+3)^2 = 19$ |

$x+3 = \pm\sqrt{19}$ |

$x = -3 \pm \sqrt{19}$ |

3

(d) $-2x^2 + x + 4 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-1 \pm \sqrt{1^2 - 4(-2)(4)}}{2(-2)}$ |

$= \frac{-1 \pm \sqrt{33}}{-4}$

$= \frac{1 \pm \sqrt{33}}{4}$

Note: Fine if they choose to $x-1$ 1st

Penalty of 1 if they don't get rid of this!

2

Solutions: Y11 2U Test 1 2/10 p.6

Q. (5) (a) (i) $-3x \geq 6$

$\div 85 \text{ by } -3.$

$x \leq -2$ (1 for sign change)

15

(ii) $2 - 3x < 16 + 4x$

$+3x - 16.$

$-14 < 7x$

$-2 < x \text{ or } x > -2$

(6) (i) $3x + 5y = 18$ (1)

$4x - 5y = -46$ (2)

$7x = -28$

$x = -4$

Sub. $x = -4$ in (1): $3x - 4 + 5y = 18$

$5y = 30$

$y = 6$

$\therefore x = -4, y = 6$

(ii) $2x + 3y = 7$ (1) $\times 3 = (3)$

$3x - 4y = 2$ (2) $\times 2 = (4)$

$6x + 9y = 21$ (3)

$6x - 8y = 4$ (4)

$17y = 17$

$y = 1$

Sub. $y = 1$ in (1):

$2x + 3 \times 1 = 7$

$2x = 4$

$x = 2$

$\therefore x = 2, y = 1$

(iii) $y = x + 6$ (1)

$2x^2 + 2y^2 = 85$ (2)

Sub. (1) in (2):

$2x^2 + 2(x+6)^2 = 85$

$2x^2 + 2x^2 + 24x + 72 = 85$

$4x^2 + 24x - 13 = 0$

$(2x-1)(2x+13) = 0$

$x = \frac{1}{2}$ or $x = -\frac{13}{2}$ 2 in total for answers

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

$y = \frac{1}{2} + 6$ [from (1)]

$= \frac{13}{2}$

If $x = -\frac{13}{2}$

$y = -\frac{13}{2} + 6$ [from (1)]

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

\therefore Either

$x = \frac{1}{2}, y = \frac{13}{2}$ OR $x = -\frac{13}{2}, y = -\frac{1}{2}$

Q. (6) (a) (i) $y = 4x - 3$ is a function.

Domain = all reals.

2

(ii) $x^2 + y^2 = 36$ is NOT a function.

Domain = $-6 \leq x \leq 6$.

2

(iii) $y = \sqrt{x+4}$ is a function.

Domain = $x \geq -4$.

2

(iv) $y = \sqrt{9-x^2}$ is a function.

Domain = $-3 \leq x \leq 3$.

2

(v) $y = \frac{2}{2x+1}$ is a function.

Domain = all reals except $-\frac{1}{2}$ [$x \neq -\frac{1}{2}$].

2

(b) (i) $2x + 3y = 6$.

y intercept ($x=0$)

$$3y = 6$$

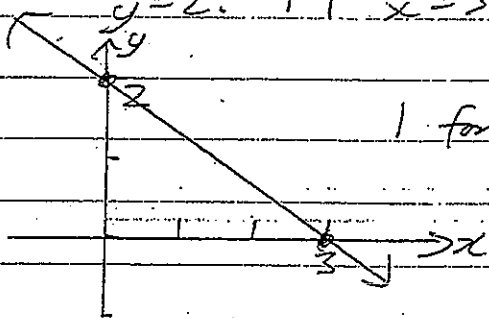
$$y = 2.$$

x intercept ($y=0$)

$$2x = 6$$

$$x = 3.$$

Graph:



1 for graph 3

(ii) $y = x^2 + 8x + 12$

y intercept = 12

x intercepts:

$$x^2 + 8x + 12 = 0$$

$$(x+6)(x+2) = 0$$

$$x = -6 \text{ or } x = -2$$

Axis of symmetry:

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

$$= -\frac{8}{2 \times 1}$$

$$= -4$$

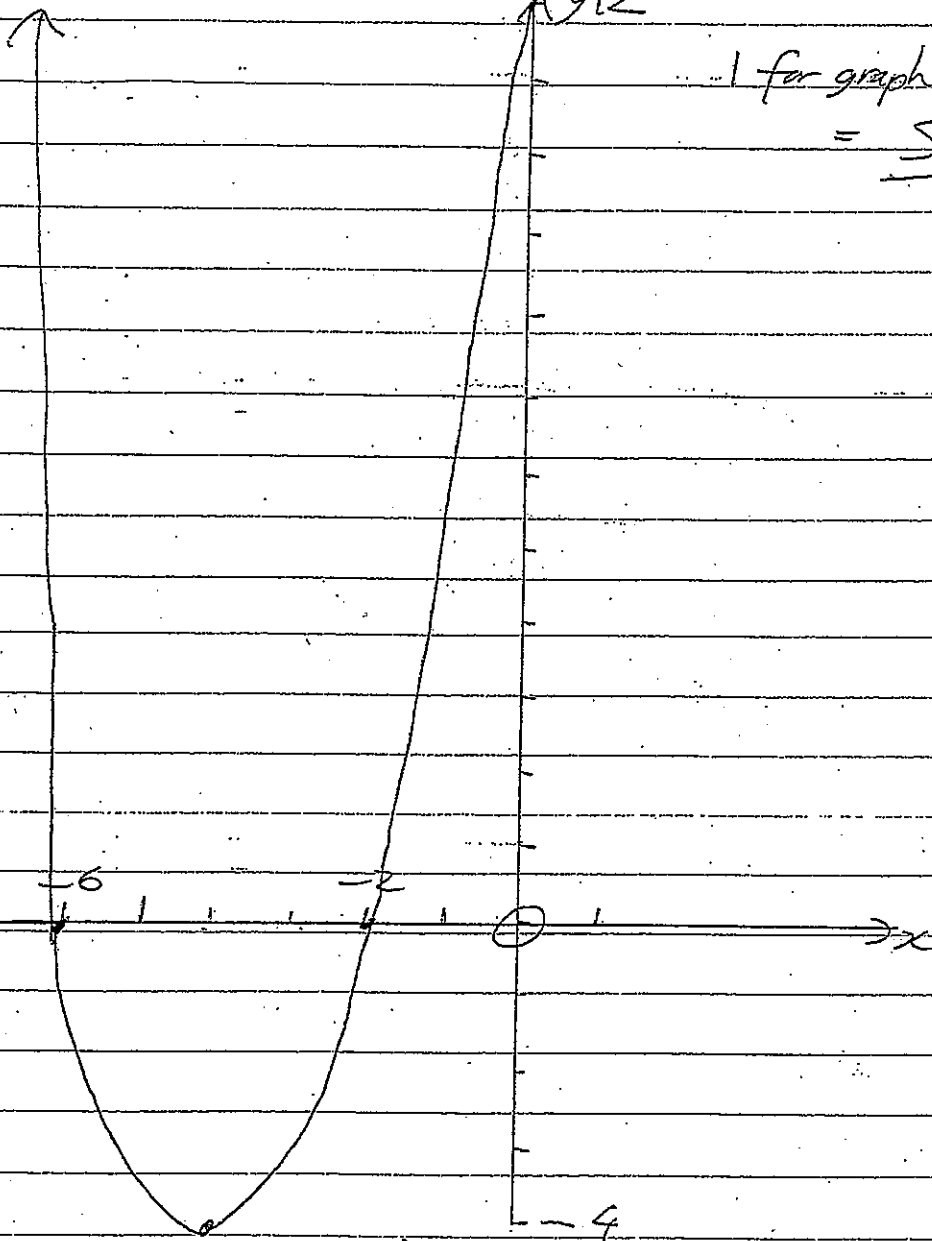
y-co-ordinate of turning point

$$= (-4) + 8(-4) + 12$$

$$= -4 \quad \text{Vertex} = (-4, -4)$$

Solutions: Y11 2U Test 1 2010 p.8

Graph of $y = x^2 + 8x + 12$.



1 for graph

5

Vertex $(-4, -4)$