



St Stephen's School Carramar

SEMESTER 1 2004

Year 10 Mathematics Development: Section A

Name: Solutions

Teacher: _____

TIME ALLOWED FOR THIS PAPER

Reading time before commencing work: 10 minutes
Working time for paper: 2 hours
Marks available 120 marks

MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER

TO BE PROVIDED BY THE SUPERVISOR

Three Question Papers: Section A – 40 marks
Section B – 40 marks
Section C – 40 marks

TO BE PROVIDED BY THE CANDIDATE

Standard Items: pens, pencils, eraser, ruler

Special Items: Drawing instruments, templates and a maximum of 2 graphics calculators satisfying the conditions set by the Curriculum Council.
One A4 size page of notes.

INSTRUCTIONS TO CANDIDATES

All questions must be attempted to gain full marks.
All working should be completed with a blue pen and diagrams in pencil.
Marks are allocated for working so show ALL your working.
Enjoy, may you achieve mathematical XTC.

IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room.
It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor BEFORE reading any further.

3. Evaluate each of the following, giving answers correctly rounded to three decimal places: (2)

(a) $\tan 45^\circ$ 1

(b) $\sin 30^\circ$ 0.5

(c) $\cos 38.17^\circ$ 0.786

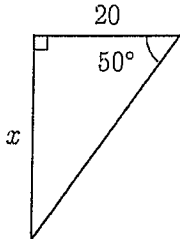
(d) $\tan 38.17^\circ$ 0.786

✓✓

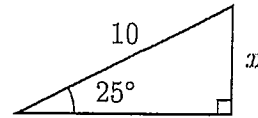
(-1 for each error.)

4. For each of the following:

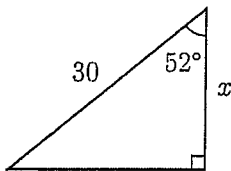
- (i) Decide which trig function applies; and
(ii) Find the value of x correct to two decimal places. (4)



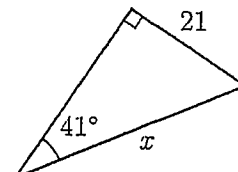
(a) Function: tan
 $\tan 50 = \frac{x}{20}$
 $x = 20 \tan 50$
 $x = 23.84$ ✓



(b) Function: sin
 $x = 10 \sin 25$
 $x = 4.23$ ✓



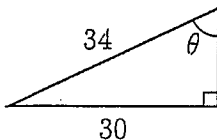
(c) Function: cos
 $x = 30 \cos 52$
 $x = 18.47$ ✓



(d) Function: sin
 $x = \frac{21}{\sin 41}$
 $x = 32.01$ ✓

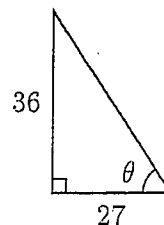
5. Find the unknown angle in each of the following triangles: (2)

(a)



$\sin \theta = \frac{30}{34}$
 $\theta = \sin^{-1} \frac{30}{34}$
 $\theta = 61.93^\circ$ ✓

(b)



$\tan \theta = \frac{36}{27}$
 $\theta = \tan^{-1} \frac{36}{27}$
 $\theta = 53.13^\circ$ ✓

9. Aaron needs to determine the area of this isosceles triangle using the formula

$$\text{Area} = \frac{1}{2} \text{base} \times \text{height}$$

- (a) What is the height of the triangle, x ?

$$\cos 32^\circ = \frac{x}{10} \quad \checkmark$$

$$x = 10 \cos 32^\circ \quad \checkmark$$

$$= 8.48 \text{ cm}$$

- (b) How long is the base of the triangle, y ?

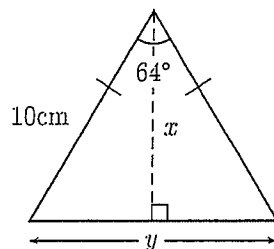
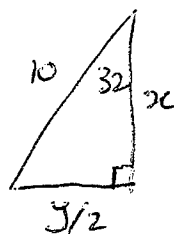
$$\sin 32^\circ = \frac{y/2}{10} = \frac{y}{20} \quad \checkmark$$

$$y = 20 \sin 32^\circ = 10.60 \text{ cm} \quad \checkmark$$

- (c) What is the area of the triangle?

$$A = \frac{1}{2}bh = \frac{1}{2} \times 10.60 \times 8.48$$

$$= 44.94 \text{ cm}^2 \quad \checkmark$$



(5)

10. In the following, θ is allowed to take values between 0° and 360° . If you wish, you may use the unit circle provided below to assist with your answers.

- (a) For **how many** values of θ is $\sin \theta = 0.95$?

$$\underline{2} \quad \checkmark$$

- (b) List **all** values of θ that satisfy $\cos \theta = -0.5$

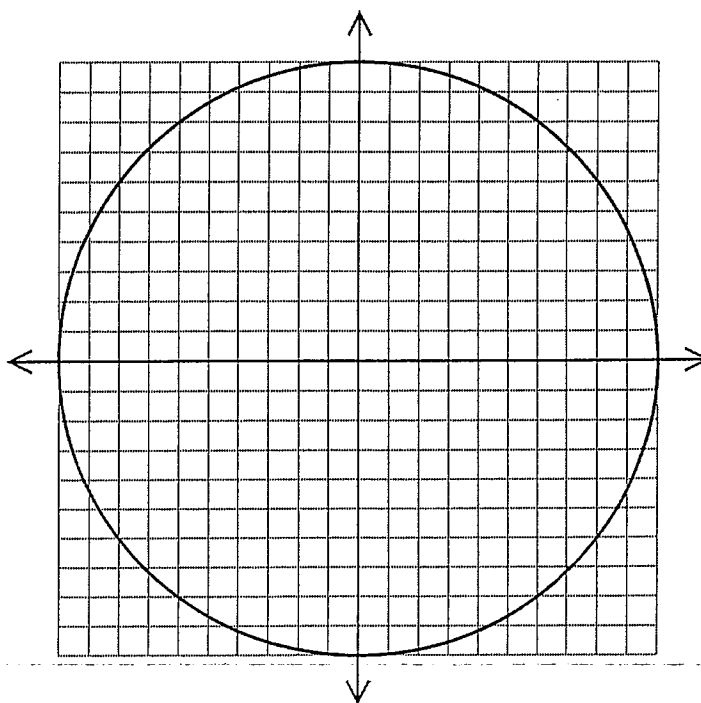
$$\underline{120^\circ, 240^\circ} \quad \checkmark$$

- (c) List **all** values of θ that satisfy $\tan \theta = \sqrt{3}$

$$\underline{60^\circ, 240^\circ} \quad \checkmark$$

- (d) For **what values** of θ is $\tan \theta$ undefined?

$$\underline{90^\circ, 270^\circ} \quad \checkmark$$



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Year 10 Mathematics Development Exam

Semester 1, 2004

Section B: Algebra

NAME: _____

MARKS: 40

Teacher: Mr Prideaux / Mrs Bartels / Mr Corcoran

1. Multiple Choice – Circle the correct answer, use the space provided for working.

(a) $\frac{(4m^2)^3 \times 3m^5}{(8m)^2 \times m^6} = \frac{64m^6 \times 3m^5}{64m^2 \times m^6} = \frac{3m^6}{m^8} = 3m^{-2} = \frac{3}{m^2}$ (2, 2, 2, 2)

- A $3m^3$ B $3m^2$ C $\frac{3m^2}{2}$ D $\frac{3m^3}{2}$ E $24m^3$

(b) $4^{-3} =$

- A -12 B -64 C $-\frac{1}{64}$ D $\frac{1}{12}$ E $\frac{1}{64}$

(c) $64^{\frac{2}{3}} =$

- A 8 B 16 C 4 D $42\frac{2}{3}$ E 512

(d) $25^{\frac{1}{2}} - 0.5^{-2} = 5 - (\frac{1}{2})^{-2} = 5 - 4 = 1$

- A 1 B 8.5 C $4\frac{7}{5}$ D 4.5 E -1

2. Simplify, expressing each with positive indices:

(1, 2, 2, 2, 1, 2)

(a) $2a^2 \times 3a^5$

$= 6a^7 \checkmark$

(b) $3s^2t^{-3} \times 2s^{-3}t^{-4}$

$= 6s^{-1}t^{-7} \checkmark$

$= \frac{6}{st^7} \checkmark$

(c) $\frac{18x^5y^{-3}}{6x^2y^{-6}}$

$= 3x^3y^3 \checkmark$

(d) $(625a^3)^{\frac{1}{4}}$

$= \sqrt[4]{625a^3} \checkmark$

(e) $(6p^4)^0$

$= 1 \checkmark$

(f) $\sqrt[4]{x^{\frac{2}{3}}}$

$= x^{\frac{2}{3} \times \frac{1}{4}} \checkmark$

$= x^{\frac{1}{6}} \checkmark$

10

3. Light travels at approximately 2.99×10^5 km/s. How long does it take light from a large explosion 35 km away to reach an observer?

(2)

$T = 35 \div 2.99 \times 10^5 \checkmark$

$= 1.171 \times 10^{-4} \text{ seconds} \checkmark$

2

~~$1.0465 \times 10^7 \text{ seconds}$~~

~~$1.171 \text{ seconds (2dp)}$~~

$1.171 \times 10^{-4} \text{ seconds} \checkmark$

$0.0001171 \dots$

4. Factorise the following:

(2, 3, 2, 3)

(a) $p^2 - 81$

$$= (p - 9)(p + 9)$$

(b) $6x^3 + 3x^2 - 3x$

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

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

(c) $75k^2 - 48m^2$

$$= 3(25k^2 - 16m^2)$$

$$= 3(5k - 4m)(5k + 4m)$$

(d) $2a^3 - 3a^2b - 8ab^2 + 12b^3$

$$= a^2(2a - 3b) - 4b^2(2a - 3b)$$

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

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

10

5. Express as a single fraction in simplest form:

(4, 3, 3)

(a) $\frac{x^2 - 16}{x^2 + 2x - 3} \div \frac{x^2 + 2x - 8}{x^2 + 6x - 7}$

$$= \frac{(x - 4)(x + 4)}{(x + 3)(x - 1)} \times \frac{(x + 7)(x - 1)}{(x + 4)(x - 2)}$$

$$= \frac{(x - 4)(x + 7)}{(x + 3)(x - 2)}$$

4

$$(b) \frac{3}{2x+5} - \frac{6}{x-3}$$

$$= \frac{3(x-3) - 6(2x+5)}{(2x+5)(x-3)} \checkmark$$

$$= \frac{3x - 9 - 12x - 30}{(2x+5)(x-3)} \checkmark$$

$$= \frac{-9x - 39}{(2x+5)(x-3)} \checkmark$$

$$(c) \frac{7}{(5x-2)(x-6)} + \frac{2}{x^2-2x-24} \rightarrow (x-6)(x+4)$$

$$= \frac{7(x+4) + 2(5x-2)}{(5x-2)(x-6)(x+4)} \checkmark$$

$$= \frac{7x + 28 + 10x - 4}{(5x-2)(x-6)(x+4)} \checkmark$$

$$= \frac{17x + 24}{(5x-2)(x-6)(x+4)} \checkmark$$

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END OF SECTION B

Student Name: SOLUTIONS

Teacher: _____

SECTION C [40 marks]**1. [18 marks] (3, 3, 3, 3, 3, 3)**

Consider the tables of number patterns below:

- (i) State the type of function each table represents as linear, quadratic, reciprocal or exponential.
- (ii) Determine an algebraic rule that accurately represents each function.

(a)

x	0	1	2	3	4	5
y	1	2	4	8	16	32

2 2 2 2 2

Common First Ratio

Type of Function: Exponential ✓Algebraic Rule: $y = 2^x$ ✓✓

(b)

x	0	1	2	3	4	5
y	10	-90	-190	-290	-390	-490

-100 -100 -100 -100 -100

Common First Diff

Type of Function: Linear ✓Algebraic Rule: $y = -100x + 10$ ✓✓

(c)

x	0	1	2	3	4	5
y	undefined	60	30	20	15	12

Type of Function: reciprocal ✓Algebraic Rule: $y = \frac{60}{x}$ ✓✓

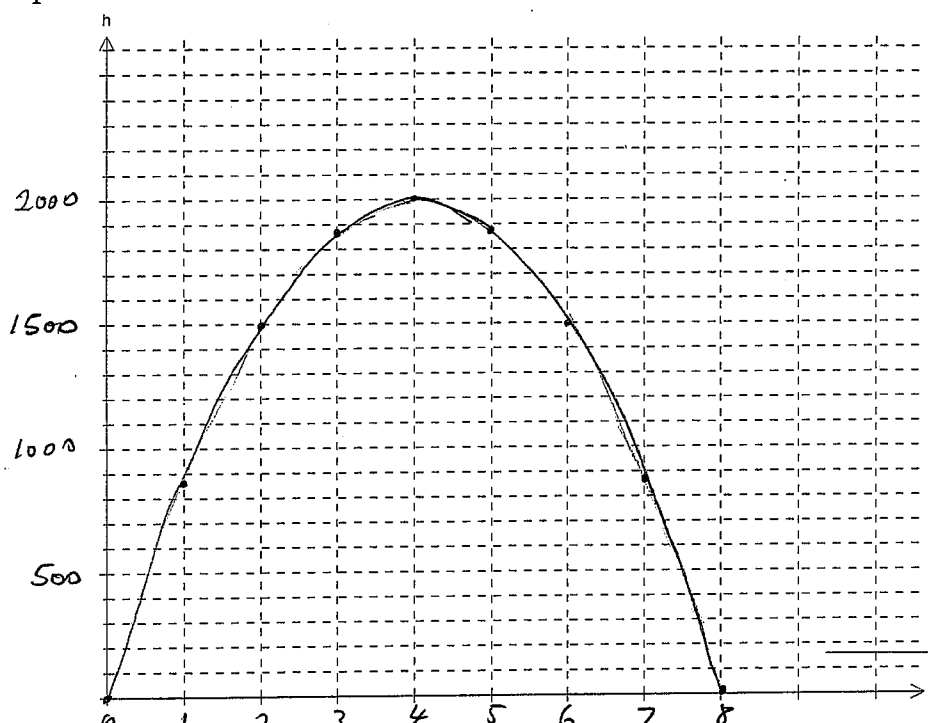
2. [10 marks] (1, 2, 1, 2, 2, 1, 1)

The equation $h = 1000t - 125t^2$ gives the height (h cm) of a ball from ground level, up into the air, and back down again to the same level from which it started. The t values give the time in seconds.

(a) Complete this table for the values of t and h .

t	0	1	2	3	4	5	6	7
h	0	875	1500	1875	2000	1875	1500	875

(b) Use the table to help you plot points to show the path of the ball on the grid provided below.



(c) Name the turning point of the graph.

$(4, 2000)$

(d) Name the horizontal and vertical intercepts of the graph.

$(0, 0)$ $(8, 0)$

(e) Find, to two decimal places, both the values of t that make $h = 300$.

$t = 0.31$ and 7.69

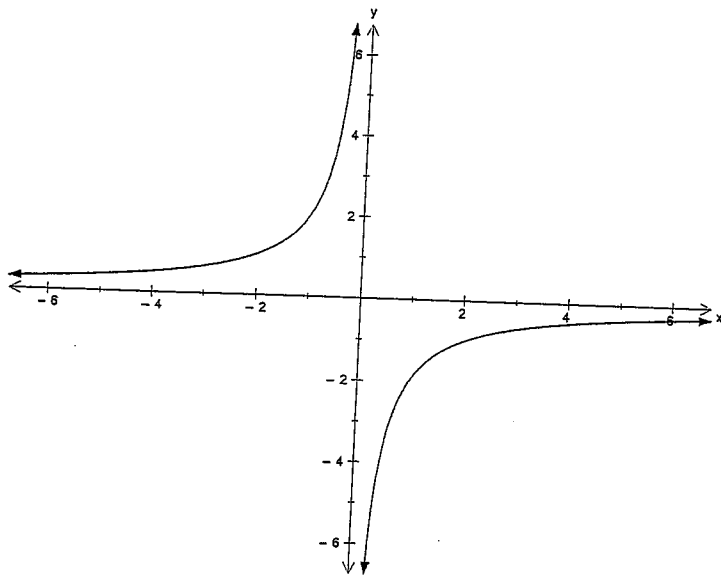
(f) Explain what is meant by the solutions you have found in (e).

When the ball is at a height of 3 m.

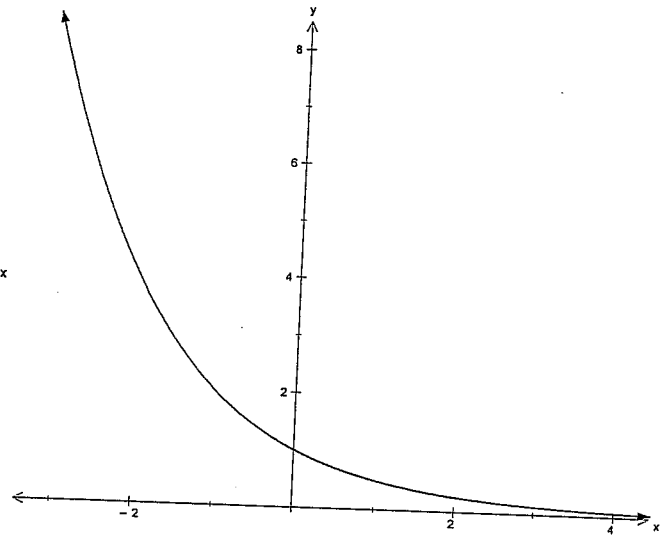
(h) Explain why there are no solutions when $t = 10$ sec.

Ball has hit the ground at $t = 8$.

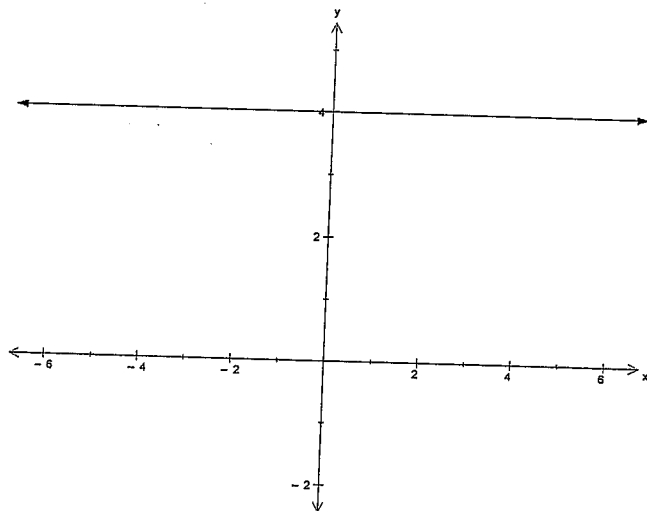
Graph (a)



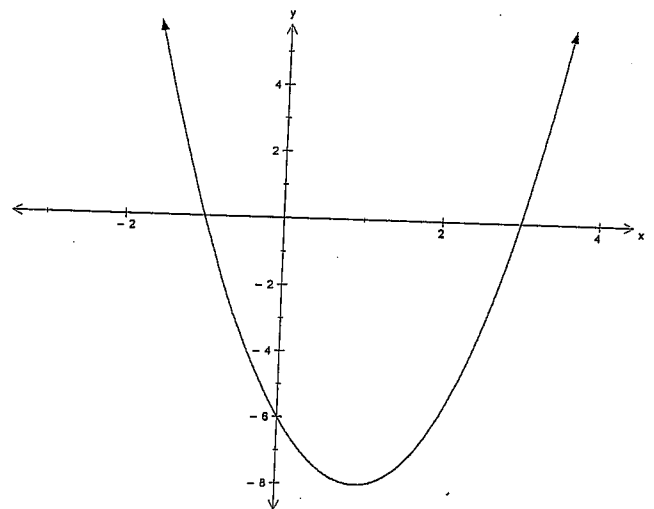
Graph (b)



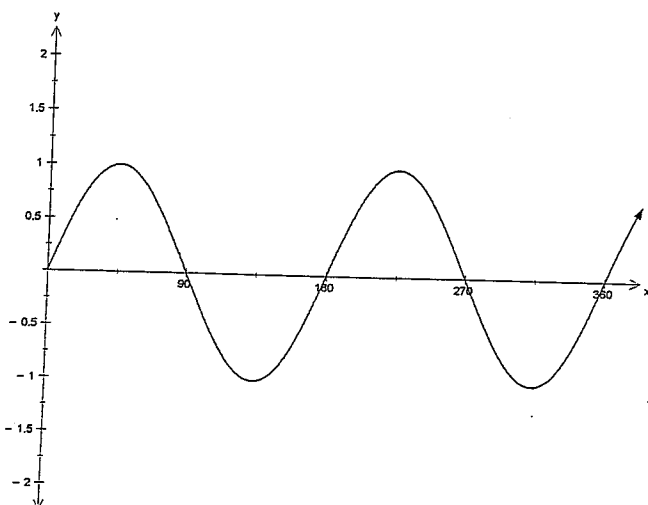
Graph (c)



Graph (d)



Graph (e)



Graph (f)

