Student Name: ..... Number: ..... Teacher: .....

NEWINGTON COLLEGE

2014
Assessment 2

Year 11 Mathematics (2 Unit)

General Instructions:

- Date of task - Wednesday 28th May (Wk 16B)
- Working time – 45 mins
- Weighting - 15%
- Board-approved calculators may be used.
- Attempt all questions, start each question in a new booklet.
- Show all relevant mathematical reasoning and/or calculations.

Total marks – 39

Question / Outcome	Real Functions	Trigonometry
Q1 Multiple choice	/2	/3
Q2	/3	/8
Q3	/7	/4
Q4	/7	/5
Total	/19	/20

Outcomes to be assessed:

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

Question 1 (5 marks) - Answer on the multiple choice answer sheet.

(a) The domain of the function $y = \sqrt{4 - x^2}$ is defined as

A $-4 \le y \le 4$ B $-2 \le x \le 2$

C $-2 \le y \le 2$ D $-4 \le x \le 4$

(b) Given $\cos\theta = -\frac{3}{5}$ and $\sin\theta < 0$, the ratio for $\tan\theta =$

A $\frac{4}{5}$ B $-\frac{4}{3}$

C $-\frac{4}{5}$ D $\frac{4}{3}$

(c) The exact value of $\sin 225^{\circ}$ is

A $-\frac{1}{\sqrt{2}}$ B $\frac{1}{\sqrt{2}}$

C $\sqrt{2}$ D $-\sqrt{2}$

(d) The coordinates of the centre and the length of the radius of the circle $(x-4)^2 + y^2 = 36$ are

A Centre (-4,0), radius = 6 B Centre (4,1), radius = 6

C Centre (4,0), radius = 36 D Centre (4,0), radius = 6

(e) The graph of $y = \tan x$ in the domain $0^0 \le x \le 360^0$ has asymptotes at

A $x = 90^0$ *and* $x = 270^0$ B $x = 180^0$

C $x = 360^0$ D $x = 0^0$ *and* $x = 180^0$

End of Question 1

Question 2 (11 marks) - Start a new booklet

(a) What is the vertex of the parabola $y = -x^2 + 5$? **1**

(b) Find the exact value of $\dfrac{2\tan 30^0}{\cos 45^0}$, leaving your answer with a rational denominator. **2**

(c) Solve the following equations in the domain $0^0 \le \theta \le 360^0$ (to the nearest minute) **4**

(i) $\sin\theta = \dfrac{1}{4}$

(ii) $2\tan\theta + 1 = 0$

(d) Given **2**

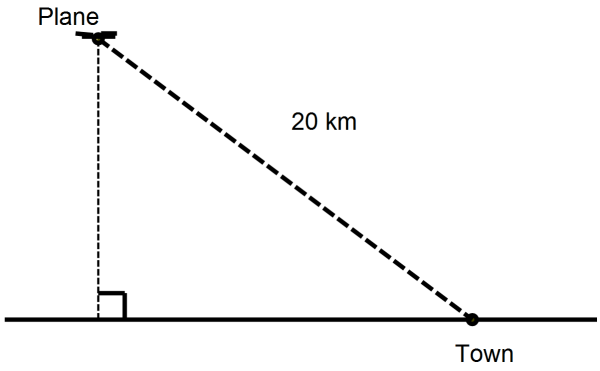
$$f(x) = \begin{cases} 1 - x & for\ x \le 0 \\ 1 - x^2 & for\ 0 < x < 1 \\ |x - 1| & for\ x \ge 1 \end{cases}$$

evaluate $f\left(\dfrac{1}{2}\right) - 2f(-3) + f\left(2\dfrac{1}{2}\right)$

(e) A plane is flying horizontally at a steady speed, 2 km above the ground. **2**

A town can be seen from the plane 20 km away.

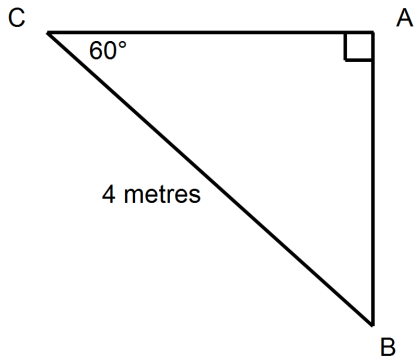
Find the angle of depression of the town from the plane, correct to the nearest degree.



End of Question 2

Question 3 (11 marks) – Start in a new booklet

(a) Find the exact length of the side AB in the triangle ABC **2**



(b) Find the exact value of $\operatorname{cosec}\left(-120^{0}\right)$ **2**

Leave your answer with a rational denominator.

(c) If $f(x) = 4x^2 - 4x - 7$

(i) find $f(k-1)$ in simplest form **2**

(ii) find the value(s) of k if $f(k-1) = 1$ **2**

(d) Sketch the intersection of the regions **3**

$$y \geq x^2 + 4 \quad \textit{and} \quad x + y < 6$$

on your own number plane. All intercepts must be shown.

End of Question 3

Question 4 (12 marks) – Start in a new booklet

(a) For the following functions, sketch the graph, showing all intercepts and asymptotes if they exist **6**

(i) $y = \dfrac{-2}{x-1}$

(ii) $y = (x+2)^3$

(iii) $y = 2|x| - 4$

(b) State the range of $y = 2^{-x} + 1$ **1**

(c) Maya drove 12 kilometres from home(**H**) to the beach(**B**) on a bearing of 254^0 to pick up her children. She then drove to the supermarket(**S**), which has a bearing of 344^0 from her home. The distance between the supermarket and her home is 4.5 kilometres.

(i) Draw a neat diagram representing this information **1**

(ii) Show that the $\angle SHB$ is $90°$ **1**

(iii) Find the bearing of the supermarket **from** the beach. **3**

Round your answer to the nearest degree.

End of Examination

Student Name:..... Number: ..... Teacher:.....

Year 11 Mathematics Q1 – Multiple Choice Answer Sheet

Completely fill the response oval representing the most correct answer.

1	A ⬭	B ⬭	C ⬭	D ⬭
2	A ⬭	B ⬭	C ⬭	D ⬭
3	A ⬭	B ⬭	C ⬭	D ⬭
4	A ⬭	B ⬭	C ⬭	D ⬭
5	A ⬭	B ⬭	C ⬭	D ⬭

YEAR 11 MATHEMATICS ASSESSMENT 2 2014

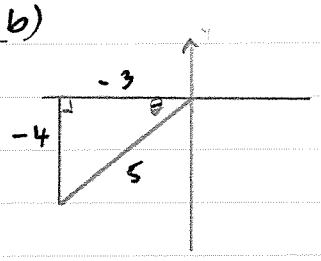
SOLUTIONS TOTAL 39 MARKS

QUESTION 1 - multiple choice (5 MARKS)

(a) domain

$-2 \leq x \leq 2$ **B**

(b)



$\tan\theta = \frac{-4}{-3}$

$= \frac{4}{3}$

D

(c) $\sin 225^\circ = \sin(180^\circ + 45^\circ)$

$= -\sin 45^\circ$

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

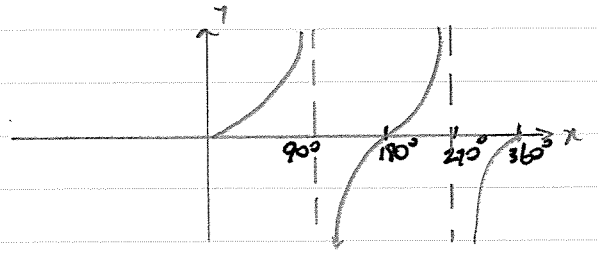
A

(d) centre (4, 0)

radius 6

D

(e)



Asymptotes at $x = 90^\circ$

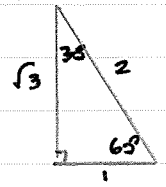
$x = 270^\circ$

A

QUESTION 2 (11 MARKS)

(a) vertex (0, 5) 1

(b)



$\frac{2 \times \frac{1}{\sqrt{3}}}{\frac{1}{\sqrt{2}}} = \frac{\frac{2}{\sqrt{3}}}{\frac{1}{\sqrt{2}}}$ 1

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

$= \frac{2\sqrt{6}}{3}$ 1

(c) (i) $\theta = 14^\circ 29'$ 1ST QUAD 1

$\theta = 165^\circ 31'$ 2ND QUAD 1

(ii) $2\tan\theta = -1$

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

basic angle: $\theta = 26^\circ 34'$

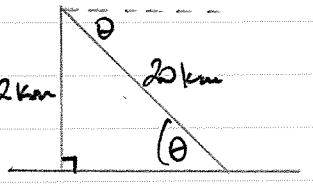
2nd Quad: $\theta = 153^\circ 26'$ 1

4th Quad: $\theta = 333^\circ 26'$ 1

(d) $\left(1 - \left(\frac{1}{2}\right)^2\right) - 2 \times (1 - -3) + \left|2\frac{1}{2} - 1\right|$ 1

$= \frac{3}{4} - 8 + 1\frac{1}{2} = -5\frac{3}{4}$ 1

(e)



$\sin\theta = \frac{2}{20}$ 1

$\theta = 5^\circ 44' 2''$

$= 6^\circ$ (to the nearest degree) 1

QUESTION 3 (11 MARKS)

(a) $\sin 60° = \frac{AB}{4}$

$AB = 4 \times \frac{\sqrt{3}}{2}$ 1

$= 2\sqrt{3}$ metres 1

(b) $\operatorname{cosec}(-120°)$

$= \frac{1}{\sin(-120°)}$

$= \frac{1}{\sin 240°}$ 1

$= \frac{1}{-\sin 60°}$

$= -\frac{1}{\sqrt{3}/2} = -\frac{2}{\sqrt{3}}$ 1

(c) (i) $f(k-1)$ 1/

$= 4(k-1)^2 - 4(k-1) - 7$

$= 4(k^2 - 2k + 1) - 4k + 4 - 7$

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

$= 4k^2 - 12k + 1$ 1

(ii) if $f(k-1) = 1$,

$4k^2 - 12k + 1 = 1$

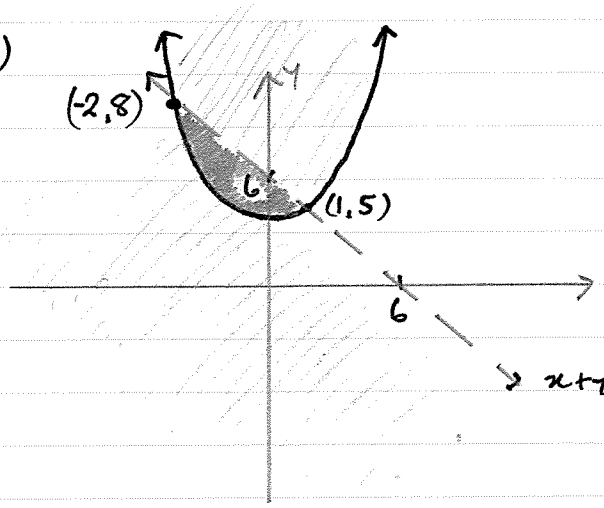
$4k^2 - 12k = 0$

$4k(k-3) = 0$

$\therefore k = 0$ or $k = 3$.

1 1

(d)

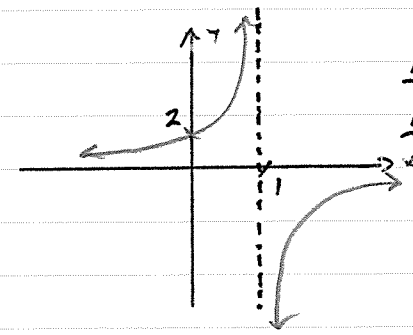


$x + y < 6$

1 for $x + y < 6$
1 for $y \geq x^2 + x$
1 for correct shaded region

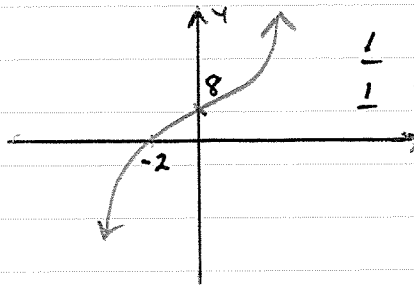
QUESTION 4 (12 MARKS)

(a) (i)



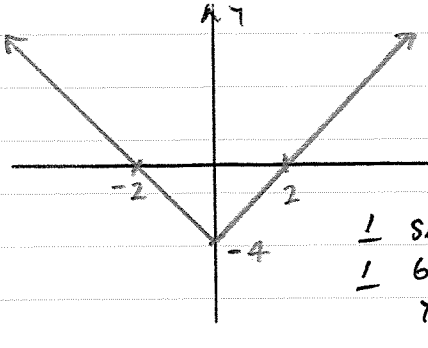
1 shape
1 intercept + asymptote

(ii)



1 shape
1 x-y intercepts

(iii)

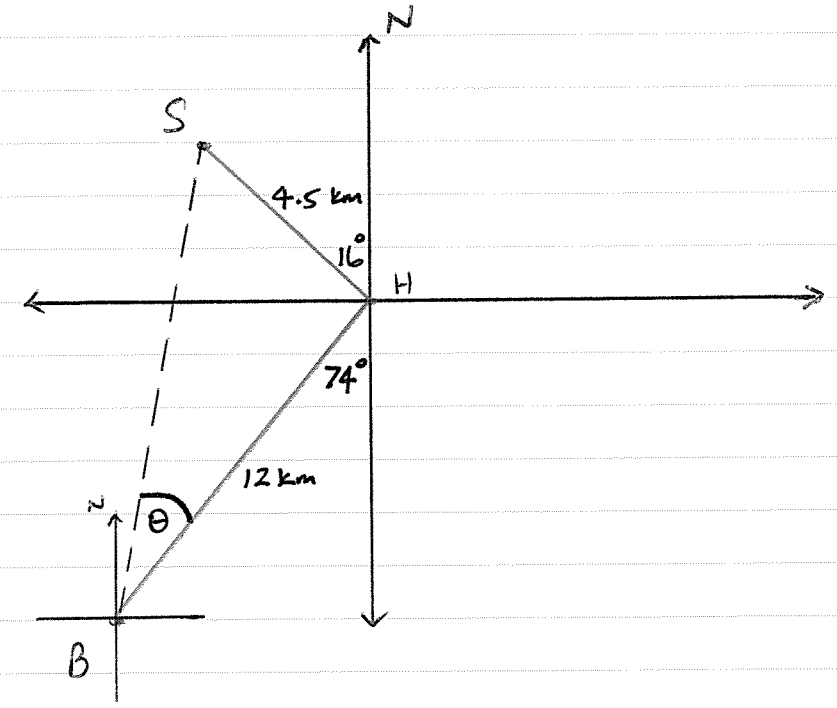


1 shape
1 both x and y intercepts

QUESTION 4 Cont'd

(b) Range $y > 1$ 1

(c) (i)



1

(ii) $\angle$ SH Nth Pole $= 16°$

$\angle$ BH Sth Pole $= 74°$

$\angle$ SHB $= 180° - 74° - 16° = 90°$ 1

(iii) From the diagram

Find θ: $\tan \theta = \frac{4.5}{12}$ 1

$\theta = 20° 33' 22''$ 1

$\angle$ NBH $= 74°$ (alternate angle)

Bearing : $74° - 20° 33' 22''$

$= 53° 26' 38''$ 1

$= 053°$ to the nearest degree