GOSFORD HIGH SCHOOL

Year 11 Preliminary
MATHEMATICS
Assessment task 2
2014

Time Allowed: 60 minutes + 5minutes reading

INSTRUCTIONS:

- Calculators may be used.
- **Section 1** must be answered on the **multiple choice sheet provided**
- **Section 2, Section 3 Part A** and **Section 3 Part B** must be done on your **own** paper ensuring you start **each** section on a **new page.**
- Show all necessary working. Marks may be deducted for careless or badly arranged work

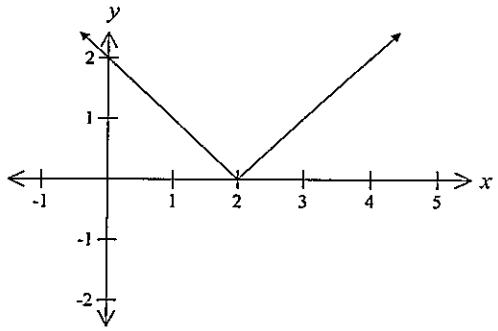
Section 1 Multiple Choice	**/4**
Section 2 Real Functions	**/18**
Section 3A Plane Geometry	**/12**
Section 3B Plane Geometry	**/8**
TOTAL	**/42**

Section 1 (Multiple choice)

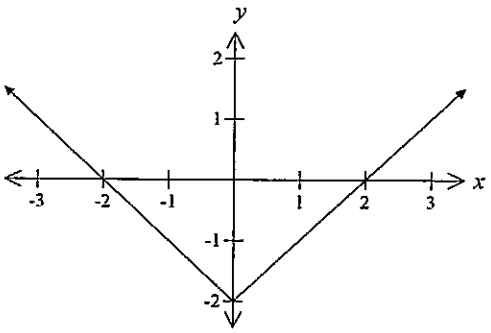
Answer the following 4 multiple choice questions on the answer sheet provided

1 Which graph best represents $y = |x| - 2$?

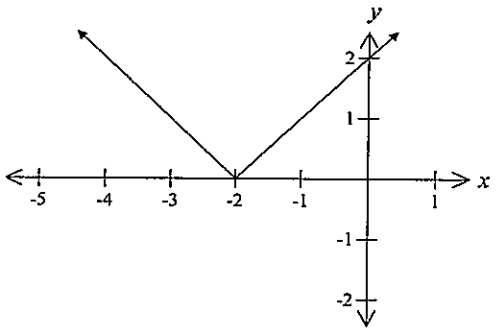
(A)



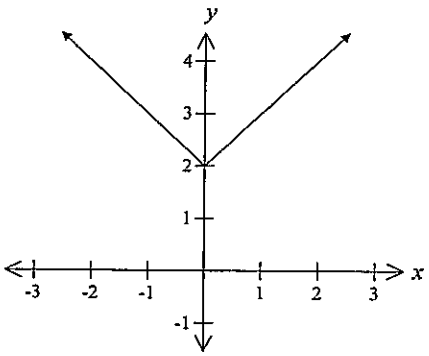
(B)



(C)



(D)



2 What is the domain and range of the function $f(x) = \sqrt{1 - x^2}$?

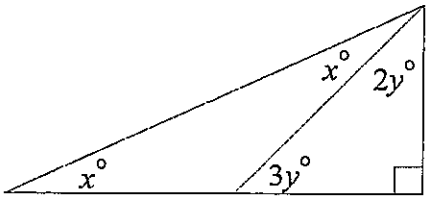
(A) Domain: $0 \le x \le 1$, Range: $-1 \le y \le 1$

(B) Domain: $-1 \le x \le 1$, Range: $-1 \le y \le 1$

(C) Domain: $-1 \le x \le 1$, Range: $0 \le y \le 1$

(D) Domain: $0 \le x \le 1$, Range: $0 \le y \le 1$

3



What is the value of x?

(A) 18°
(B) 27°
(C) 36°
(D) 45°

4 What is the centre and radius of the circle with the equation $x^2 + y^2 + 6x - 8y - 11 = 0$?

(A) Centre $(-3,-4)$ and radius 36
(B) Centre $(-3,4)$ and radius 36
(C) Centre $(-3,-4)$ and radius 6
(D) Centre $(-3,4)$ and radius 6

END OF MULTIPLE CHOICE QUESTIONS

Section 2 **Real Functions (START A NEW PAGE)** **Marks**

1. If $f(x) = 2x^4 - 3x^2 + 6$, find
   (i) $f(1)$ 1
   (ii) $f(-2)$ 1
   (iii) $2f(1) - [f(-2)]^2$ 1
   (iv) $f(a) - f(-a)$ 1

2. For $g(x) = 3x^3 - 4x$
   (i) show that $g(x)$is an odd function 1
   (ii) state the domain and range 1

3. $f(x) = \begin{cases} 2x+3 & when \quad x > 2 \\ 1 & when \quad -2 \leq x \leq 2 \\ x^2 & when \quad x < -2 \end{cases}$

   (i) Evaluate $f(-3), f(-2), f(2)$ *and* $f(3)$ 2
   (ii) Hence sketch the curve 3

4. State the range of $y = |x| + 3$ 1

5. State the domain of $y = \frac{1}{x^2-1}$ 1

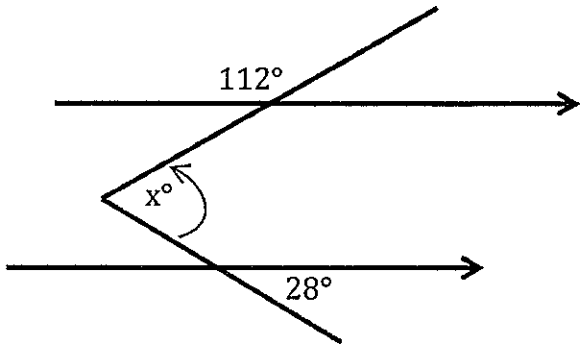
6. If $f(x) = 2x^2 - 2x - 12$, solve $f(x) = 0$ 2

7. Given that $\frac{2x+7}{x+3} = 2 + \frac{1}{x+3}$, draw a neat sketch of the graph of $y = \frac{2x+7}{x+3}$ showing all important features 3

Section 3 Part A **Geometry (START A NEW PAGE)** **Marks**

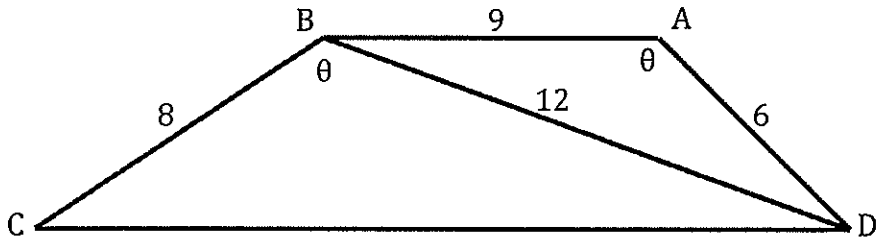
1. For a regular 12 sided polygon (dodecagon) find,
   (i) The angle sum of this polygon 1
   (ii) The size of each exterior angle 1

2.



From the diagram above find the value of x. (reasons not required) 1

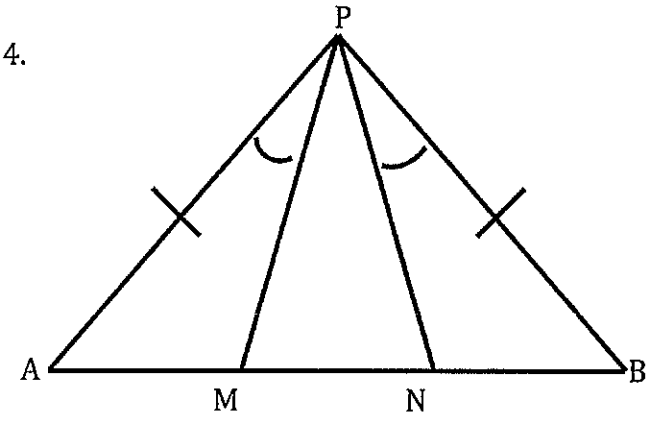
3.



In the diagram above $\angle CBD = \angle BAD$

(i) Prove $\Delta CBD \,|||\, \Delta BAD$ 2
(ii) Find the length of CD 1
(iii) Prove that AB and CD are parallel 2

4.

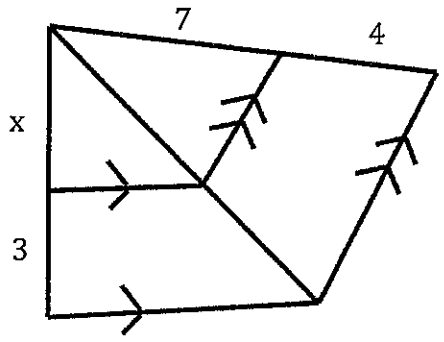


In the diagram above PA =PB and $\angle APM = \angle BPN$

(i) Prove that $\Delta PAM \equiv \Delta PBN$ 3
(ii) Why is $\angle AMP =$ ~~$\angle NBP$~~? $\angle PNB$ 1

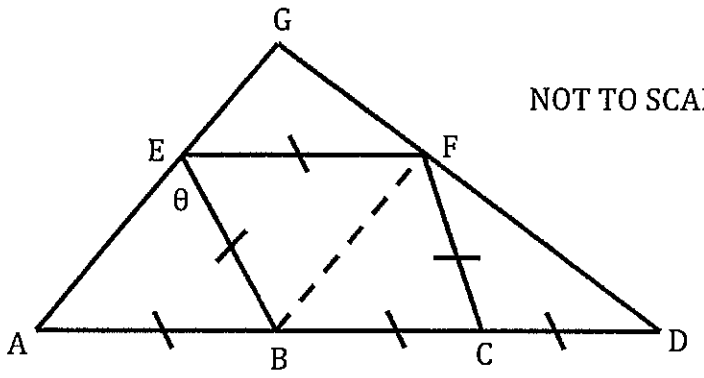
Section 3 Part B **Geometry (START A NEW PAGE)** **Marks**

1. Find the value of x in the diagram below.(reasons not required) 1



NOT TO SCALE

2. ABCD is a straight line such that AB=BC=CD
EFCB is a rhombus and $\angle AEB = \theta$



NOT TO SCALE

(i) Show that $\angle EBC = 2\theta$ 2

(ii) The diagonal BF is drawn in the rhombus EFCB.
Show that BF || AE 2

(iii) Hence or otherwise, find the size of $\angle AGD$ 3

END OF EXAMINATION

2014 Preliminary Mathematics Task 2
Student Name/Number:_____

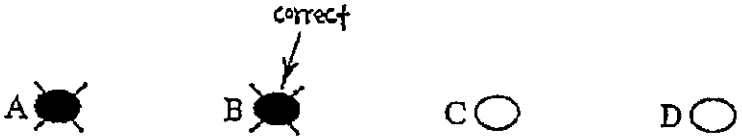
Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9

A○ B● C○ D○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word correct and drawing an arrow as follows.



1. A○ B○ C○ D○
2. A○ B○ C○ D○
3. A○ B○ C○ D○
4. A○ B○ C○ D○

2014 Mathematics Yr 11 Task 2

Section 1

① (B)

② (C)

③ $90 = 5y \qquad 2x = 3y$

$y = 18 \qquad 2x = 54$

$x = 27$ (B)

④ $x^2 + 6x + 9 + y^2 - 8y + 16 = 11 + 9 + 16$

$(x+3)^2 + (y-4)^2 = 36$ (D)

Section 2

1. (i) 5 (ii) 26 (iii) $10 - 676 = -666$ (iv) 0 (as even)

2. (i) $g(x) = 3x^3 - 4x \qquad g(-x) = 3(-x)^3 - 4(-x)$

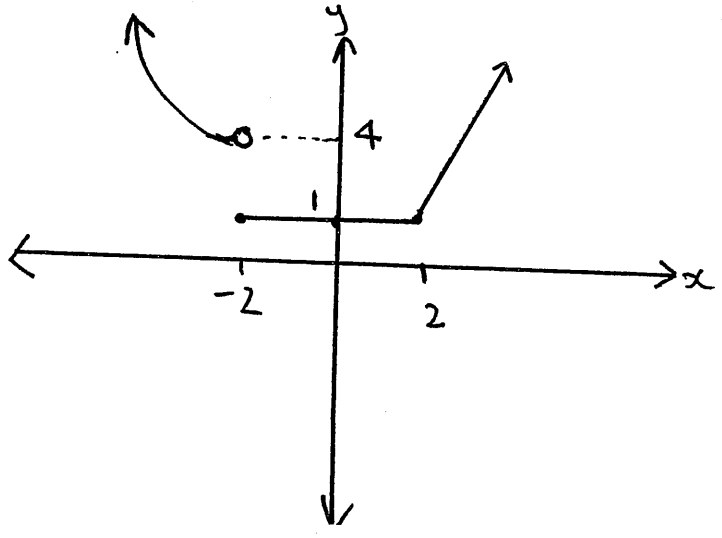
$= -3x^3 + 4x$

$\therefore g(x) = -g(-x) \quad \therefore$ odd func.

(ii) D: all real x

R: all real y

3. (i) $f(-3) = 9 \quad f(-2) = 1 \quad f(2) = 1 \quad f(3) = 9$



4. range is $y \geq 3$

5. $x > 1$ OR $x < -1$ is the domain

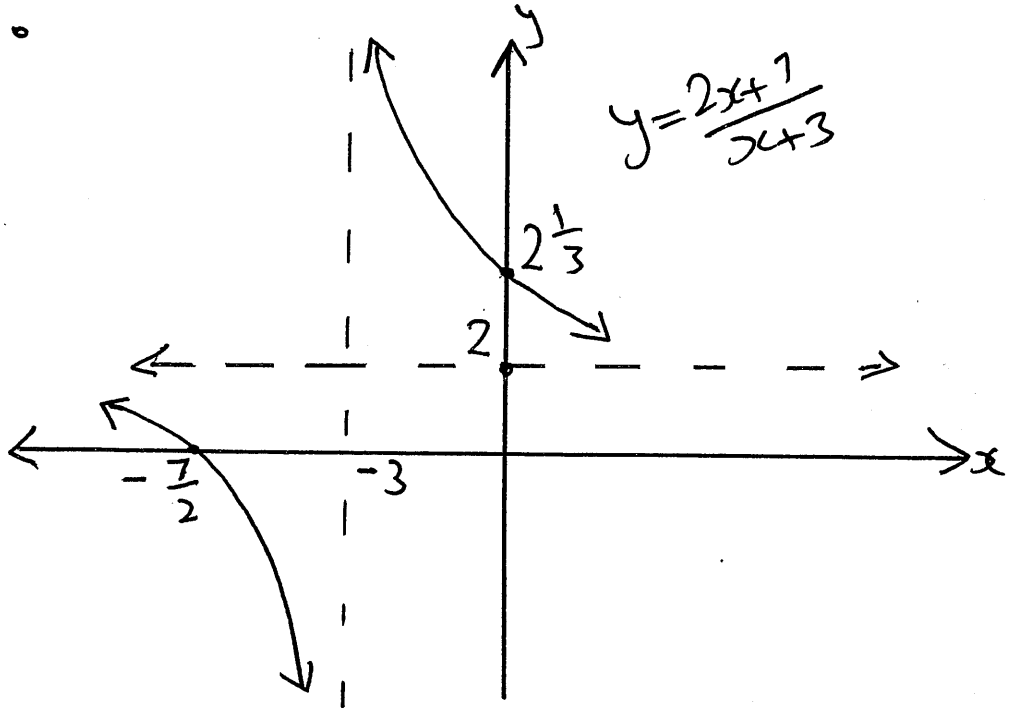
6. $2x^2 - 2x - 12 = 0$

$2(x^2 - x - 6) = 0$

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

$x = 3$ OR $x = -2$

7.



Section 3 Part A

1. (a) 1800°

(b) 30°

2. 96°

3. $\angle CBD = \angle BAD$

$$\frac{CB}{AD} = \frac{8}{6} = \frac{4}{3}$$

$$\frac{BD}{AB} = \frac{12}{9} = \frac{4}{3}$$

$$\therefore \frac{CB}{AD} = \frac{BD}{AB}$$

$\therefore \triangle CBD \,|||\, \triangle BAD$ (two sides in ratio, included $\angle$ equal)

(ii) $\frac{x}{12} = \frac{4}{3}$

$3x = 48$

$x = 16$

(iii) $\angle ABD = \angle CBD$ (similar $\triangle$'s corresp'ly $\angle$'s)

$\therefore$ AB ∥ CD (alternate $\angle$'s equal)

4. (i) $\angle PAM = \angle PBN$ (base $\angle$'s isosceles $\triangle APB$ given $PA = PB$)

$PA = PB$ (given)

$\angle APM = \angle BPN$ (given)

$\therefore \triangle PAM \equiv \triangle PBN$ (AAS)

(ii) $\angle AMP = \angle PNB$ (corresponding $\angle$'s Congruent $\triangle$'s)

Section 3 (Part B)

(i) $\frac{x}{3} = \frac{7}{4} \therefore x = 5\frac{1}{4}$

(ii) $\angle EAB = \theta$ (base $\angle$'s isosceles $\triangle$ given $\angle AEB = \theta$

$\angle EBC = \angle EAB + \angle AEB$

$= \theta + \theta$

$= 2\theta$ (ext $\angle$ $\triangle EAB$)

(iii) $\angle EBF = \angle FBC = \theta$ (Diagonal rhombus bisects $\angle EBC = 2\theta$)

$\therefore \angle FBC = \angle EAB = \theta$

$\therefore$ $BF \parallel EA$ (corresponding $\angle$'s $=$)

(iii) $\angle CBF = \angle BFC = \theta$ (base $\angle$'s isosceles $\triangle BFC$)

$\angle FCD = 2\theta$ (ext $\angle$ $\triangle BFC$)

$\angle FDC = 90 - \theta$ ($\angle$ sum $\triangle FCD$)

$\therefore \angle AGD = 180 - (90 - \theta) - \theta$ ($\angle$ sum $\triangle GAD$)

$= 90°$