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RANDWICK GIRLS HIGH SCHOOL

YEAR 11

2U Mathematics and Mathematics Extension 1

TERM 3 ASSESSMENT

10 August 2005

Examiner: J. Agami

Time allowed: 45 minutes

Instructions: Start each question on a new page.

Marks will be deducted for careless or badly arranged work.

Liquid paper is not to be used.

Place this question sheet on the front of your answers.

QUESTION	MARKS
1	10.8 / 12
2	10 / 15
3	11 / 13
TOTAL	28.2 / 40

31

QUESTION 1 (12marks)

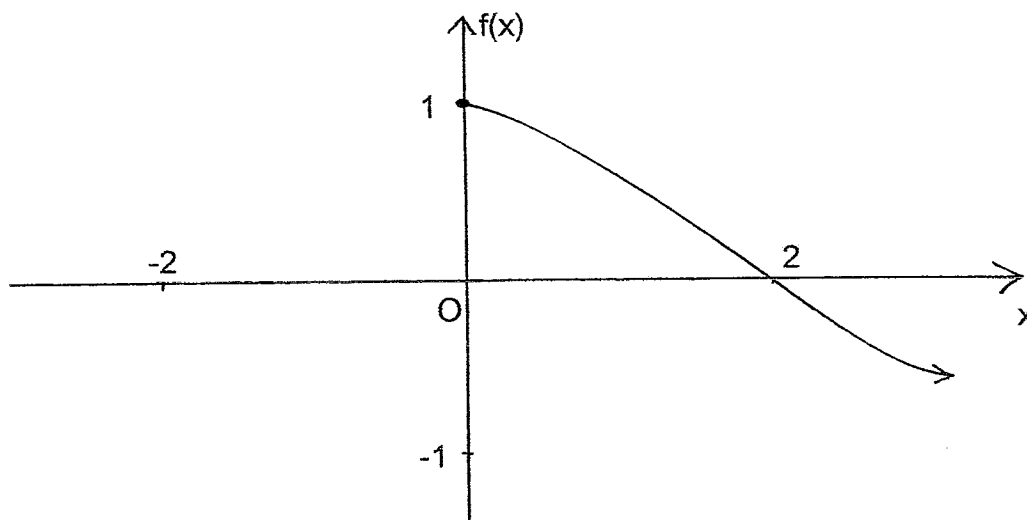
- a) For the line whose equation is $2y + 3x - 5 = 0$, find:
- (i) the gradient of the line **1**
 - (ii) the angle at which the line crosses the x -axis **1**
 - (iii) the y -intercept **1**
- b) Find the equation of the line passing through $(2, -3)$ that is parallel to the line with equation $3x + 4y - 5 = 0$ **3**
- c) Find the perpendicular distance between $(-3, 2)$ and $5x + 12y + 7 = 0$ **3**
- d) Find the equation of the perpendicular bisector of the line joining the points $A(6, 4)$ and $B(-2, -2)$ **3**

QUESTION 2 (15 marks)

- a) For the function $f(x) = x^2 - 2x$:
- (i) find $f(-3)$ **1**
 - (ii) find x when $f(x) = 0$ **2**
 - (iii) find $f(2-t)$ **1**
- b) Sketch the following functions and state the domain and range for each.
- (i) $y = x^2 - 2x - 8$ **3**
 - (ii) $y = |2x - 3|$ **3**
- c) On the same set of axes, sketch the region $x^2 + y^2 < 1$ and $y \geq x$ **3**

Question 2d continued over the page

c) Part of the graph of the function $y = f(x)$ is shown below.



Draw ~~two~~ (2) neat copies of this graph and label them (A), and (B).

Complete the graphs of $y = f(x)$ on each sketch so that :

- (i) In (A), $y = f(x)$ is an EVEN function. 1
- (ii) In (B), $y = f(x)$ is an ODD function. 1

QUESTION 3 (13 marks)

- a) Find the exact value of $\tan 300^\circ$ 2
- b) Find the values of $\cos \theta$ and $\tan \theta$ if $\sin \theta = \frac{2}{\sqrt{29}}$ and θ is obtuse. 2
- c) The angle of depression from a cliff 30 metres high to a ship is 13° . How far is the ship from the base of the cliff? 2
- d) Solve $\sin 2\theta = \frac{1}{\sqrt{2}}$ for $0^\circ \leq \theta \leq 360^\circ$ 3
- e) A ship sails 30 km due east, then 20 km on a bearing of 143° . If it is now 44.97 km from its starting point:
- (i) draw a diagram on your worksheet showing this information. 1
- (ii) find the true bearing of the ship from its starting point (to the nearest minute) 3

END OF PAPER

Question 1

10
12

2

a) i) $m = \frac{-b}{a}$
 $= \frac{-3}{2}$

II. $\tan \theta = \frac{-3}{2}$
 $= \frac{-3}{2}$
 $(23^\circ 41')$

III. $y = mx + c$
 $0 = 2y + 3(0) - 5$
 $= -5$

R.2

b. $3x + 4y - 5 = 0$ $y - y_1 = m(x - x_1)$
 $m = \frac{-b}{a}$ $y + 3 = \frac{-1}{3}(x - 2)$
 $= \frac{-1}{3}$ $3y + 9 = -x + 2$
 $0 = 4x + 3y + 1$

Perpendicular

3

c) d. $|ax + by + c|$
 $\frac{|5x + 12y + 7|}{\sqrt{5^2 + 12^2}}$
 $= \frac{|5(-3) + 12(2) + 7|}{13}$
 $= \frac{16}{13}$
 $= 1.23 \text{ units.}$

d. $\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$
 $\frac{y - 4}{x - 6} = \frac{-2 - 4}{-2 - 6}$
 $\frac{y - 4}{x - 6} = \frac{+6}{+8}$
 $8y - 32 = 6x - 36$
 $8y = 6x - 4$
 $m_1 = \frac{6}{8}$

$m_1 \times m_2 = -1$
 $m_2 = -\frac{4}{3}$

3

midpts. $(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2})$
 $= (\frac{6 + 2}{2}, \frac{4 + 2}{2})$
 $= (2, 1)$

$y - y_1 = m(x - x_1)$
 $y - 1 = \frac{-4}{3}(x - 2)$
 $3y - 3 = -4x + 8$
 $0 = 4x + 3y - 11$

Question 2

10/15

3

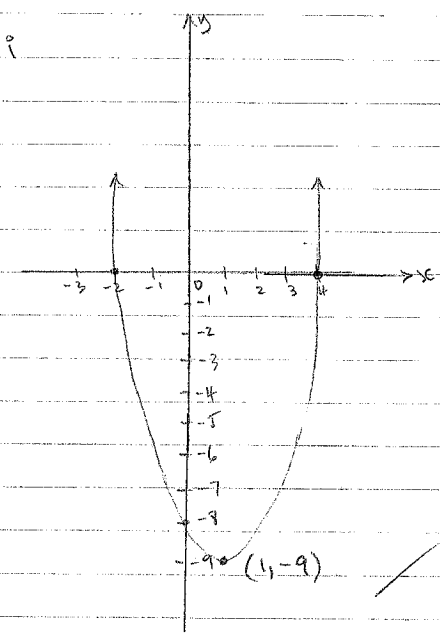
a) $f(x) = x^2 - 2x$

i) $(-3)^2 - 2(-3) = 15$

II. $0 = (x^2 - 2x)$
 $0 = x(x - 2)$
 $x = 0$
 $x = 2$

III. $f(x) = x^2 - 2x$
 $f(2 - t) = (2 - t)^2 - 2(2 - t)$
 $= 4 - 4t + t^2 - 4 + 2t$
 $= t^2 - 2t$
 $= t(t - 2)$
 $t = 0$
 $t = 2$

b) i



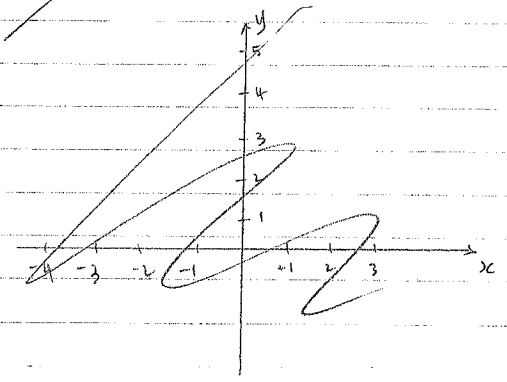
$y = x^2 - 2x - 8$
 $= (x - 4)(x + 2)$
 $\frac{-b}{2a} = \text{axis of sym.}$
 $= 1$

1/2

D = all real x

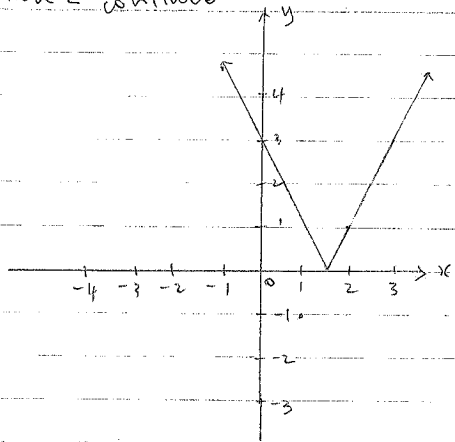
R = all y all real y except $y = -9$

II. Nx + Py



Question 2 continued

II).



D. all real x except.

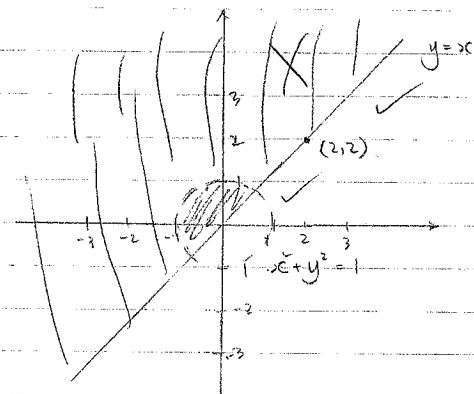
~~$x > 0$~~

R. all real y except.

$y > 0$

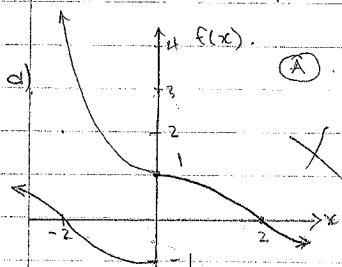
22

c)

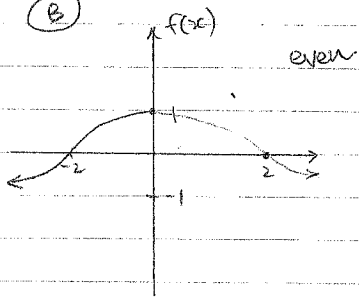


2

d)



(B)



D.

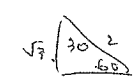
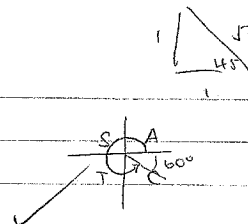
symmetrical about the origin.

Must label odd or even

Question 3.

a) $-\tan 300^\circ$
 $= \tan -60^\circ$
 $= -\sqrt{3}$

2

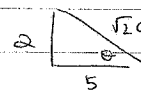


~~10/13~~ 11/13.

b) $\sin \theta = \frac{2}{\sqrt{29}}$

$\cos \theta = \frac{5}{\sqrt{29}}$

$\tan \theta = \frac{opp}{adj} = \frac{2}{5}$



$\cos \theta = \frac{5}{\sqrt{29}}$

$\tan \theta = \frac{2}{5}$

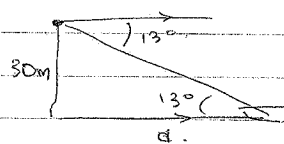
$\theta = 360 + 31^\circ 48'$
 $= 381^\circ 48'$

$\theta = 180 - 21^\circ 48'$
 $= 158^\circ 12'$

1/2/2

c)

2



$\tan 13^\circ = \frac{30}{d}$

$d = \frac{30}{\tan 13^\circ}$
 $= 129.94m$

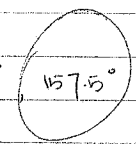
d)

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

$0 \leq 2\theta \leq 720^\circ$

$2\theta = 45^\circ$

$\theta = 22\frac{1}{2}^\circ$



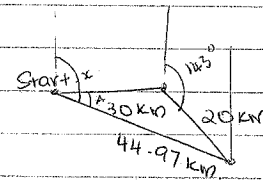
$\frac{180 - 45}{2}$

$67^\circ 30'$

$202^\circ 30', 247^\circ 30'$

e) i.

4.



$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

$= \frac{30^2 + 44.97^2 - 20^2}{2 \times 30 \times 44.97}$

$A = 20^\circ 48'$

$90 + 20^\circ 48' = 110^\circ 48'$