



Name: .....

Teacher: .....

SCEGGS Darlinghurst

Year 10

Common Test 3

Thursday 24<sup>th</sup> August, 2010

# Mathematics

## Pathway 5.3E

Task Weighting 20%

Outcomes Assessed: PAS 5.1.2, PAS 5.2.3, PAS 5.3.3, PAS 5.3.5,  
PAS 5.3.6, WMS 5.3.2, WMS 5.3.3

### General Instructions

- Time allowed – 50 minutes
- Attempt all questions
- Write using blue or black pen
- Answer in the spaces provided in the examination paper
- Show all necessary working in the spaces provided for each question
- Marks may be deducted for careless or badly arranged work
- Mathematical templates, geometrical equipment and scientific calculators may be used

Section	Possible Mark	Mark Awarded
Graphing Functions	21	
Coordinate Geometry	19	
<b>TOTAL</b>	<b>40</b>	

Average: .....

Standard Deviation:.....

Parents Signature: .....

**GRAPHING FUNCTIONS**

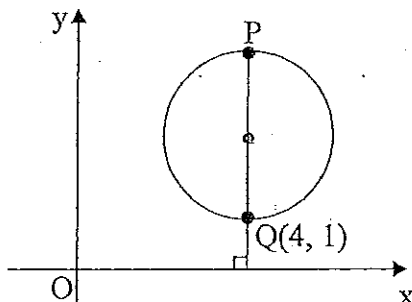
**Question 1**

**Marks**

Draw the graphs of  $y = x^2 + 4$  and  $x^2 + y^2 = 16$  on the same set of axes. How many points do the curves have in common?

3

**Question 2**

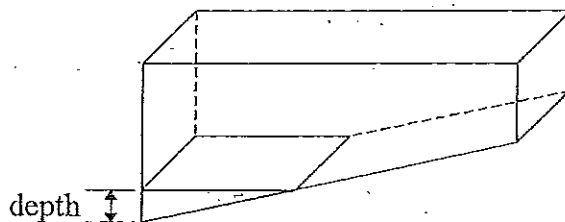


NOT TO SCALE

This circle has radius 2 units. PQ passes through the centre of the circle and is perpendicular to the x axis. Q is the point (4, 1).

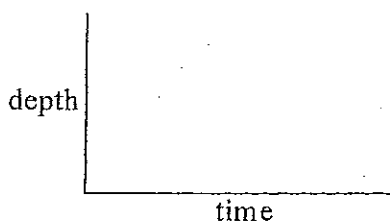
- a. Find the point P 1
- b. Find the equation of the circle. 2

**Question 3**



This swimming pool has a sloping bottom. Water is flowing into the pool at a constant rate. Copy the axes below and draw a graph that illustrates the change in depth of the water over time.

3



3

**Question 4**

Sketch the curves in separate diagrams clearly indicating, asymptotes and at least 3 points on each graph:

a.  $y = \frac{1}{x+2}$  2

b.  $y = 2^x - 2$  3

**Question 5**

Sketch the curves in separate diagrams, clearly showing x and y intercepts and turning point (vertex)

a.  $y = -(x - 2)^2 + 3$  3

b.  $y = 2x^2 + 6x - 8$  3

Name:.....

COORDINATE GEOMETRY

Question 1

Find the midpoint of the interval joining the points  $(10, 5)$  and  $(2, -1)$ .

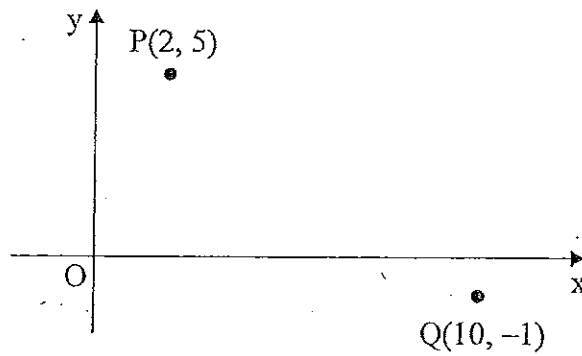
2

Question 2

Find the equation of the line parallel to the x axis through the point  $(2, 3)$ .

1

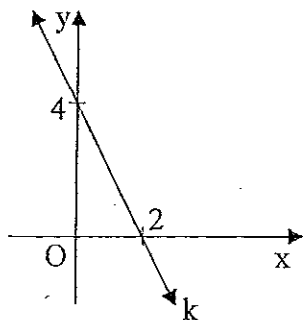
Question 3



Find the distance from P to Q.

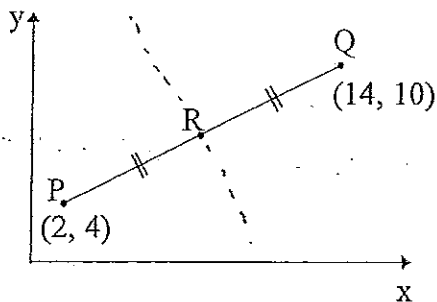
2

**Question 4**



- a. Find the gradient of line k. 1
- b. Find the equation of line parallel to line k, passing through (6,3) 2

**Question 5**

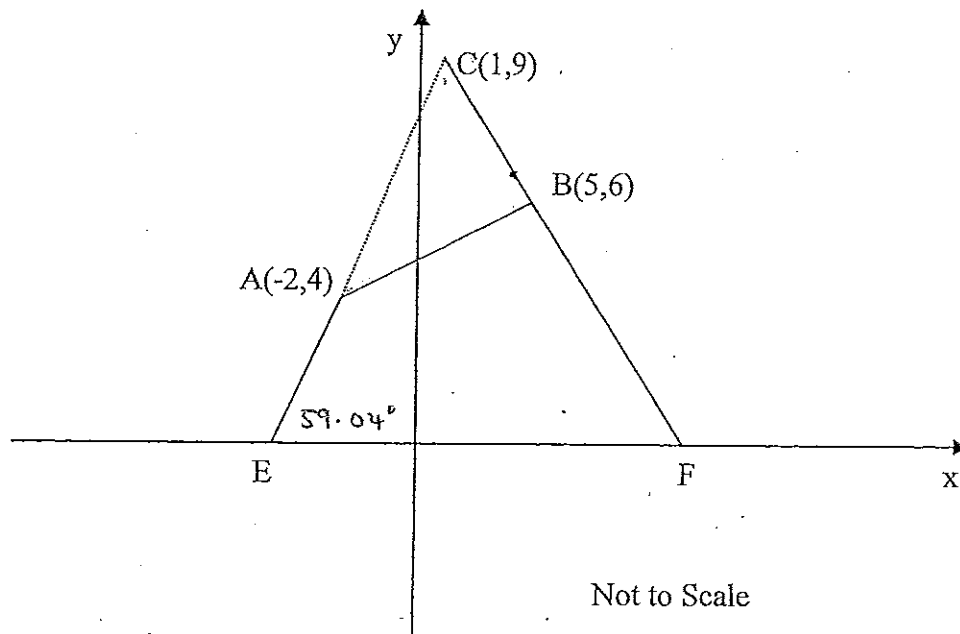


Given that R is equidistant from P and Q

- a. Find the distance from R to the y axis. 1
- b. Find the equation of the line  $l_1$  which passes through R and is perpendicular to line segment PQ 2
- c. Find where the equation of the line  $l_1$  cuts the x axis 2

**Question 6**

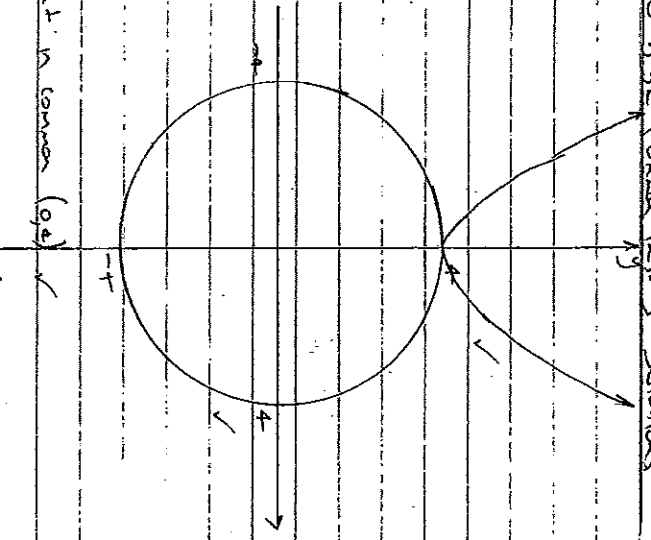
In the diagram below, the points  $A(-2, 4)$ ,  $B(5, 6)$  and  $C(1, 9)$  form a triangle.  $CA$  and  $CB$  are produced to intersect the  $x$  axis at  $E$  and  $F$  respectively.



- |    |  |   |
|----|--|---|
| a. | Find the lengths of, $AC$ , and $BC$   | 2 |
| b. | Given that $\angle CEF = 59.04^\circ$ , find $\angle CFE$ and hence show that $\angle ACB = 89.09^\circ$ | 2 |
| c. | Hence find the area of $\triangle ABC$   | 2 |

Y10 5.3E Conics Test 3 Solutions

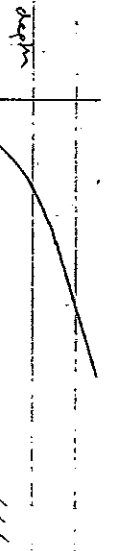
Q1 a)



one point in common (0, 0) ✓

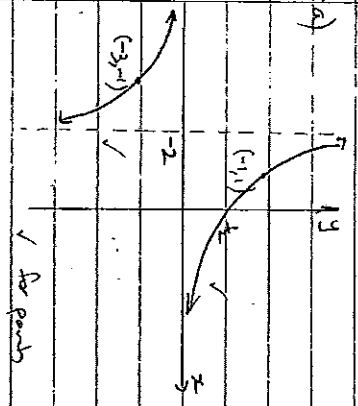
Q2 a) (4, 5) ✓

b)  $(x-4)^2 + (y-3)^2 = 4$  ✓



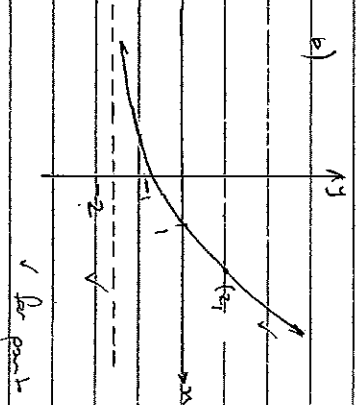
Q3

Q4 a)



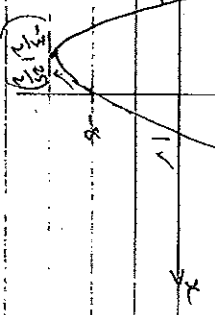
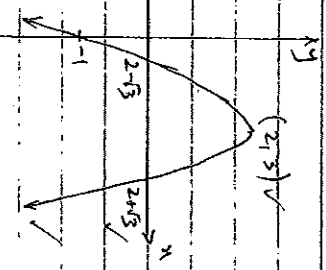
✓ for part

b)



✓ for part

Q5 a)



Vertex: (2, 3)

$y - v_1: x = 0$

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

$= -1$

$x - v_1: y = 0$

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

$(x-2)^2 = 3$

$x-2 = \pm\sqrt{3}$

$x = 2 \pm \sqrt{3}$

$y - v_2: x = 0$

$y = -8$

$x - v_2: y = 0$

$2x^2 + 6x - 8 = 0$

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

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

$x = -4 \quad x = 1$

$x = -5 \quad = -6$

$\frac{-3}{4}$

$y = 2\left(\frac{-3}{2}\right)^2 + 6\left(\frac{-3}{2}\right) - 8$

$= -\frac{25}{2}$

## Solutions Coordinate Geometry

$$1. \text{ M.P} = \left( \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right) \checkmark$$

$$= \left( \frac{10+2}{2}, \frac{5+1}{2} \right) = (6, 2) \checkmark$$

$$2. y = 3 \checkmark$$

$$3. d_{PO} = \sqrt{(10-2)^2 + (-1-5)^2} \checkmark$$

$$= \sqrt{8^2 + (-6)^2} = \sqrt{100} = 10 \checkmark$$

$$4. a) m_{PC} = \frac{(4-0)}{0-2} = \frac{4}{-2} = -2 \checkmark$$

$$b) \left. \begin{aligned} y-3 &= -2(x-6) \checkmark \\ y-3 &= -2x+12 \\ y &= -2x+15 \end{aligned} \right\} \checkmark$$

OR  $2x + y - 15 = 0 \checkmark$

$$5. a) R \text{ is midpoint } R(8, 7) \checkmark$$

∴ distance to y-axis = 8  $\checkmark$

$$b) m_{PO} = \frac{10-4}{14-2} = \frac{6}{12} = \frac{1}{2} \checkmark$$

∴  $m_{OP} = -2$  ∴  $39^\circ$   $y-7 = -2(x-8)$   
 $y = -2x + 23 \checkmark$

d) Cut x axis when  $y=0$

$$-2x + 23 = 0$$

$$2x = 23$$

$$x = 11.5 \checkmark \checkmark$$

$$Q6 a) d_{AC} = \sqrt{(1-3)^2 + (9-4)^2} = \sqrt{4+25} \checkmark$$

$$= \sqrt{29} \checkmark$$

$$d_{BC} = \sqrt{(5-1)^2 + (6-9)^2} = \sqrt{16+9} \checkmark$$

$$= \sqrt{25} = 5 \checkmark$$

$$b) m_{CB} = \frac{9-6}{1-5} = \frac{3}{-4} = -\frac{3}{4}$$

$$\therefore \angle CPE = 180 - \tan^{-1} \left( -\frac{3}{4} \right) \checkmark$$

$$= 36.8698^\circ$$

$$\therefore 36.8698 + 59.04 = \underline{\underline{84.09^\circ}} \checkmark$$

$$c) \text{ Area} = \frac{1}{2} \cdot 5 \cdot \sqrt{41} \sin 84.09^\circ$$

$$= \boxed{16.0057} \text{ m} \quad \boxed{16.58} \checkmark$$

OR

$$\text{Area} = \frac{1}{2} \cdot 5 \cdot \sqrt{41} \sin 84.09^\circ$$

$$= \boxed{15.9227} \text{ m} \quad \boxed{14.5} \checkmark$$