Name: .....

Teacher: .....

SCEGGS Darlinghurst

Year 10
Common Test 3
Thursday 24th 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	
TOTAL	40	

Average: ..... Standard Deviation: .....

Parents Signature: .....

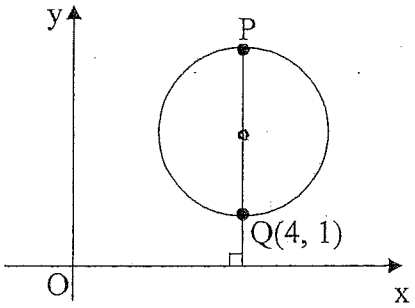
Name:.....

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



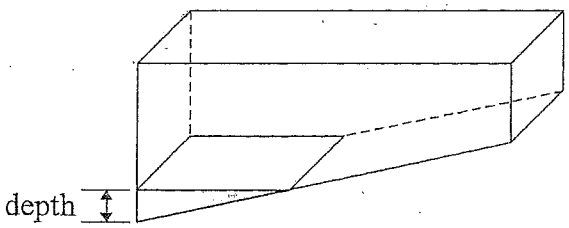
NOT TO SCALE

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).

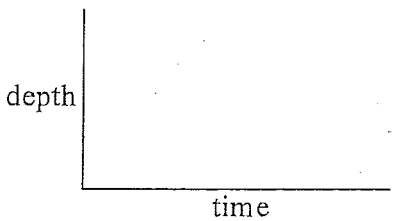
a. Find the point P 1

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

Name:.....

Question 4

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

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

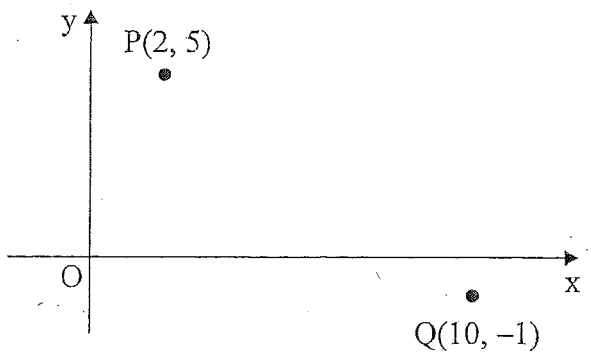
Question 1

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

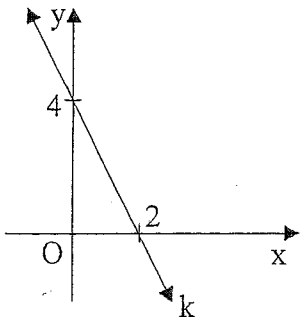
Question 3



Find the distance from P to Q. 2

Name:.....

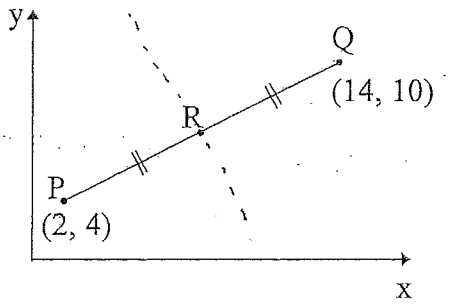
Question 4



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

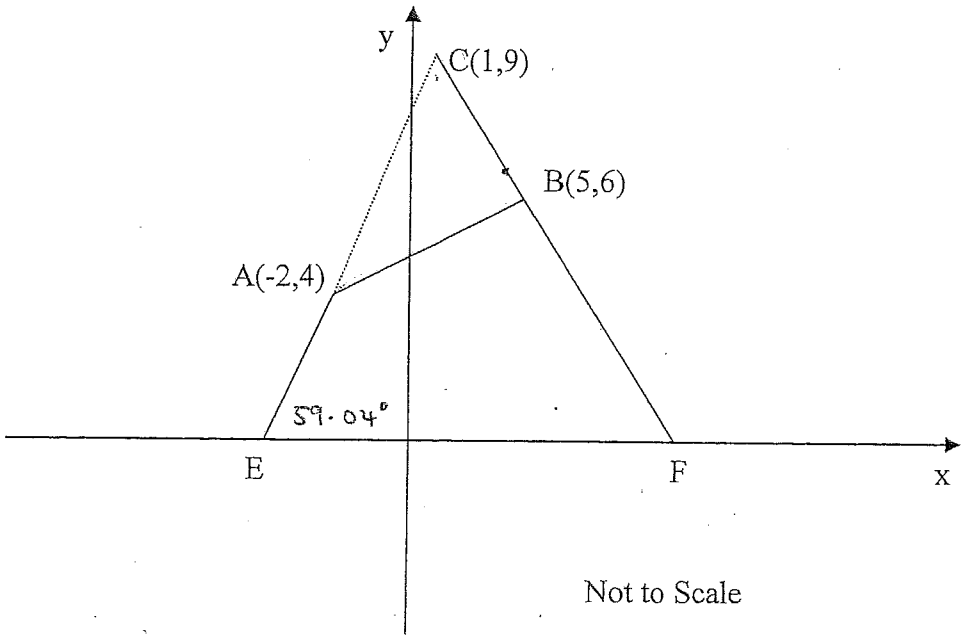
b. Find the equation of the line l_1 which passes through R and is perpendicular to line segment PQ 2

c. Find where the equation of the line l_1 cuts the x axis 2

Name:.....

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 nd F respectively.



Not to Scale

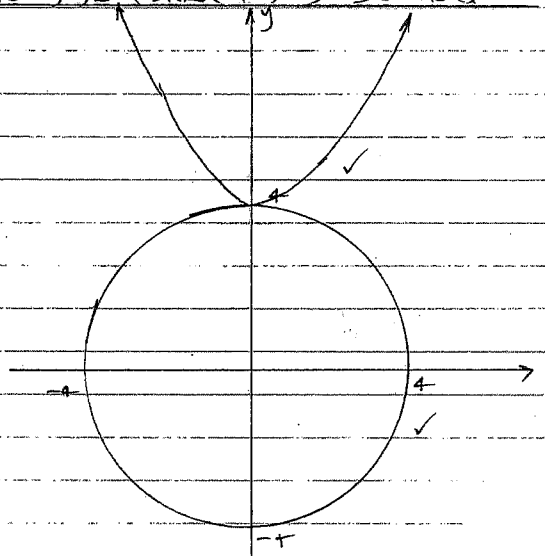
a. Find the lengths of, AC, and BC 2

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 ΔABC 2

Y10 5.3E Common Test 3 Solutions

Q1 a)

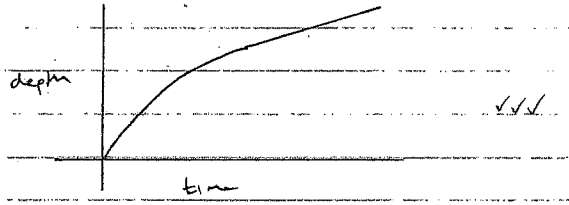


one point in common $(0,4)$ ✓

Q2 a) $(4,5)$ ✓

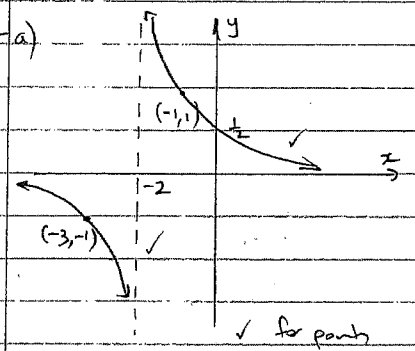
b) $(x-4)^2+(y-3)^2=4$ ✓✓

Q3



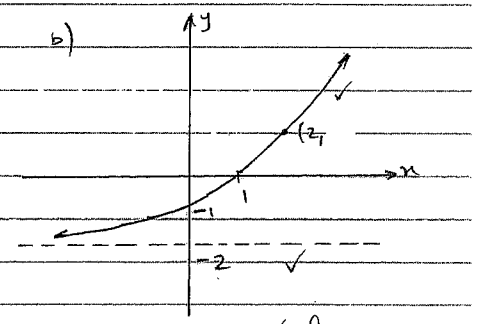
✓✓✓

Q4 a)



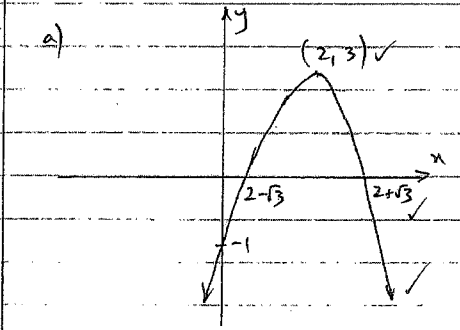
✓ for parts

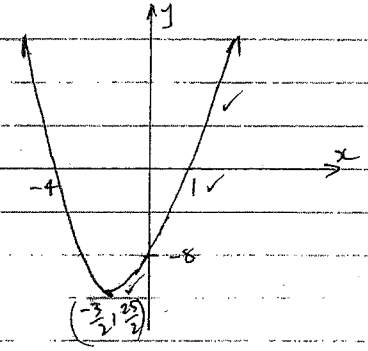
b)



✓ for parts

Q5 a)





vertex $(2,3)$

y-int: $x=0$

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

$=-1$

x-int: $y=0$

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

$(x-2)^2=3$

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

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

y-int: $x=0$

$y=-8$

x-int: $y=0$

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

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

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

$x=-4 \quad x=1$

$x=\frac{-b}{2a}=\frac{-6}{4}$

$=-\frac{3}{2}$

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

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

Solutions Coordinate Geometry

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

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

2. $y = 3$ ✓

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

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

4. a) $m_k = \frac{(4-0)}{0-2} = \frac{4}{-2} = -2$ ✓

b) $y - 3 = -2(x-6)$ ✓

$y - 3 = -2x + 12$

$y = -2x + 15$

or $2x + y - 15 = 0$ ✓

5.) a) R is midpoint $R(8, 7)$

∴ distance to y axis $= 8$ ✓

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

∴ $m_{\perp} = -2$ ∴ Eq: $y - 7 = -2(x-8)$

$y = -2x + 23$

d) Cuts x axis when $y = 0$

∴ $-2x + 23 = 0$

$2x = 23$

$x = 11.5$ ✓✓

Q6 a) $d_{AC} = \sqrt{(1--3)^2+(9-4)^2} = \sqrt{16+25}$

$= \sqrt{41}$ $\sqrt{34}$ ✓

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

$= \sqrt{25} = 5$ ✓

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

∴ $\angle CFE = 180 - \tan^{-1}\left(-\frac{3}{4}\right)$ ✓

$= 36.8698°$

∴ $36.8698 + 59.04 = 84.09°$ ✓

c) Area $= \frac{1}{2} \cdot 5 \cdot \sqrt{41} \sin 89.09°$

$= 16.0057\ u^2$ $14.584\ u^2$ ✓✓

OR

Area $= \frac{1}{2} \cdot 5 \cdot \sqrt{41} \sin 84.09°$

$= 15.9227\ u^2$ $14.5\ u^2$