SCEGGS Darlinghurst

Name: .....

Teacher: .....

Preliminary Assessment Task 3
Thursday, 1st June, 2006

Mathematics

Task Weighting: 15%

General Instructions

- Time allowed – 45 minutes
- You are allowed to bring in one A4 handwritten page of notes
- Write your name at the top of each page
- Start each question on a new page
- Attempt **all** questions and show all necessary working
- Marks will be deducted for careless or badly arranged work
- Mathematical templates, geometrical equipment and scientific calculators may be used

Question	Com.	Reas.	Marks
1	/2		/10
2	/2	/5	/10
3	/6	/4	/13
TOTAL	/10	/9	/33

Name: .....

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Name: .....

Question 1 (10 marks) **Marks**

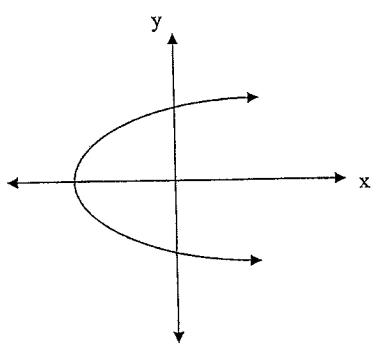
(a) Given $f(x) = x^2 - 3x$

i) Evaluate $f(-2)$ 1

ii) Find x when $f(x) = 0$ 2

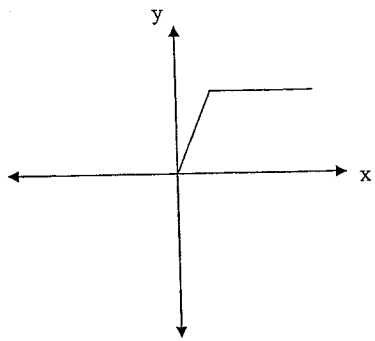
(b) Show that the function $f(x) = 3x^4 + x^2$ is an even function 2

(c) Is the graph shown below a function? Explain your answer 1



Name: .....

(d) Part of a graph is shown below. Copy and complete this graph so that it is an odd function 1



(e) The following function is a circle. State its centre and radius 3

$$x^2 + y^2 - 2x + 8y + 9 = 0$$

Name: .....

Question 2 (10 Marks) — Marks

(a) Prove that — 2

$$\tan\alpha \sin\alpha + \cos\alpha = \sec\alpha$$

(b) (i) Sketch the graph of $y = \cos 2x$ for $-180° \le x \le 180°$ — 2

(ii) State the amplitude and period — 2

(iii) Is $y = \cos 2x$ an odd or even function? Explain your answer — 1

(c) Simplify $\dfrac{\sin\theta}{1+\cos\theta} + \dfrac{1+\cos\theta}{\sin\theta}$ — 3

Name: .....

Question 3 (13Marks) — Marks

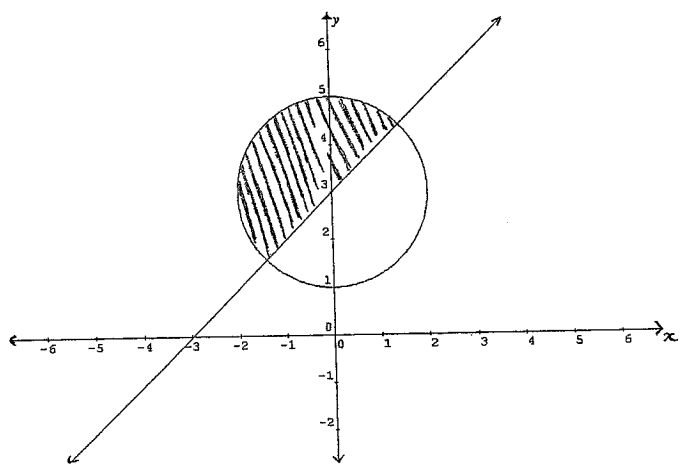
(a) Sketch the following graphs, showing all important features. State the domain and range for each graph

(i) $y = 3 - x^2$ — 3

(ii) $y = \dfrac{2}{x+1}$ — 3

(iii) $y = |2x - 6|$ — 3

(b) State the inequations that represent the region shaded below — 4



End of Assessment

SCEGGS Darlinghurst

Name: Solutions

Teacher: .....

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Question 1. (MF)

ai) $f(-2) = (-2)^2 - 3\times -2$
$= 10$ ✓

ii) $0 = x^2 - 3x$
$x = 0, 3$ ✓✓

poorly done. Factorise and solve for x.

b) $f(x) = 3x^4 + x^2$
$f(-x) = 3(-x)^4 + (-x)^2$ ✓
$= 3x^4 + x^2$
$= f(x)$ ✓

A clear conclusion must be given.
$f(-x) = f(x)$ ∴ even

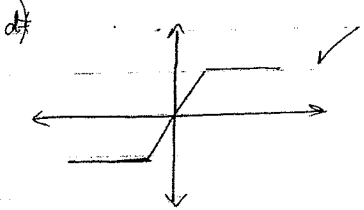
c) Not a function as there ✓ is more than 1 y-value for at least 1 x-value
OR using the vertical line test a v. line can be drawn that passes through the graph at more than 1 point.

C1

Learn to spell vertical

A good reason to state is The graph does not have one-to-one correspondence.

d)



C1 ✓

e) $x^2 - 2x + 1 + y^2 + 8y + 16 = -9 + 1 + 16$ ✓
$(x-1)^2 + (y+4)^2 = 8$
∴ centre $(1, -4)$ ✓
radius $= 2\sqrt{2}$ ✓

poorly done.
Learn this completing the square method.

Question 2. (AV)

a) $\tan\alpha \sin\alpha + \cos\alpha = \sec\alpha$

$LHS = \frac{\sin\alpha}{\cos\alpha} \times \sin\alpha + \cos\alpha$

$= \frac{\sin^2\alpha}{\cos\alpha} + \frac{\cos^2\alpha}{\cos\alpha}$ ✓

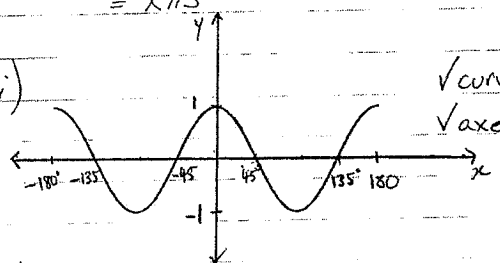
$= \frac{1}{\cos\alpha}$

$= \sec\alpha$ ✓

$= RHS$

(R 2)

bi)



(C 2)

✓curve
✓axes

You should always label the x & y axes clearly, also show a clearly marked scale.

ii) amp = 1 ✓
period = 180° ✓

iii) Even as it is symmetrical about the y-axis. ✓

c) $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta}$

$= \frac{\sin^2\theta + (1+\cos\theta)^2}{\sin\theta(1+\cos\theta)}$ ✓

$= \frac{\sin^2\theta + 1 + 2\cos\theta + \cos^2\theta}{\sin\theta(1+\cos\theta)}$

$= \frac{(\sin^2\theta + \cos^2\theta) + 1 + 2\cos\theta}{\sin\theta(1+\cos\theta)}$

$= \frac{1 + 1 + 2\cos\theta}{\sin\theta(1+\cos\theta)}$ ✓

$= \frac{2(1+\cos\theta)}{\sin\theta(1+\cos\theta)}$

$= 2\cos\theta$ ✓

(R 3)

Poorly Done!

$(1+\cos\theta)^2 \neq 1 + \cos^2\theta$

- When fractions are involved find a common denominator
- Factorise before cancelling DO NOT cancel terms that are being added or subtracted.

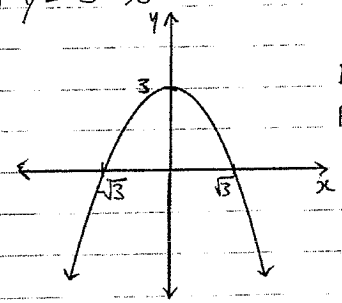
(eg. $\frac{1+\alpha}{2+\alpha} = \frac{1}{2}$ is NOT true)

(R 4)

Question 3. (SL)

✓✓ for graph, ✓ for D & R

ai) $y = 3 - x^2$

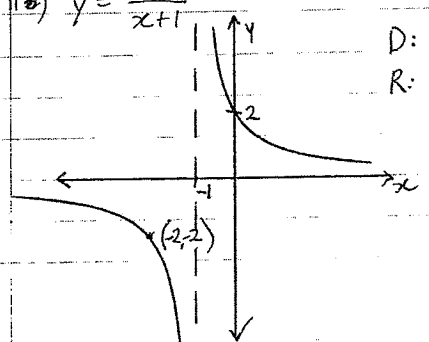


D: all real x
R: $y \leq 3$

- Learn how to draw parabolas properly!
- must find x-intercepts on easy parabolas.

(C 6 (graphs))

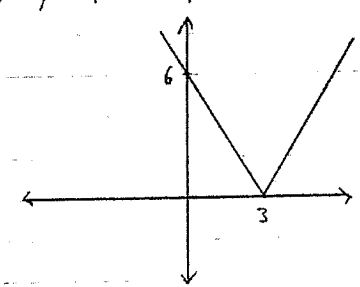
ii) $y = \frac{2}{x+1}$



D: all real x but $x \neq -1$
R: all real y but $y \neq 0$

- Need to label other point or y-intercept.
- must also state all real x not just $x \neq -1$

iii) $y = |2x - 6|$



D: all real x
R: $y \geq 0$

b) $x^2 + (y-3)^2 \leq 4$ ✓
$y \geqslant x + 3$ ✓✓