**

**Mathematics Specialist Unit 2**

# Test 4

**Trigonometric Identities and Matrices**

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| **Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Total Marks:\_\_\_\_\_\_\_\_\_\_** |
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|  |

**Task type: Response**

**Time allowed for this task:** 60 minutes, in-class, under test conditions

Section One: Calculator-free 38 minutes ( 34 marks)

(3 Minutes Reading – 35 Minutes Working)

Section Two: Calculator-assumed 22 minutes ( 20 marks)

(2 minutes Reading - 20 minutes working)

**Materials required:** Calculator with CAS capability (to be provided by the student)

**Standard items:** Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

**Special items:**  Drawing instruments, templates, notes on one unfolded sheet of   
A4 paper, and up to three calculators approved for use in the WACE examinations

Formula sheet

**Marks available: 54 marks**

**Task weighting: 7%**

**Section One : Calculator Free 34 Marks**

**Time Allowed 30 minutes**

Question 1 (8 marks)

For the following matrices

1. Determine the following, if not possible explain why. (5 marks)
3. CB
4. BC
5. Use a matrix method to solve the system of equations and .

(3 marks)

(iv) BC

Question 2 (9 marks)

Let and , where is a constant.

(a) Simplify . (3 marks)

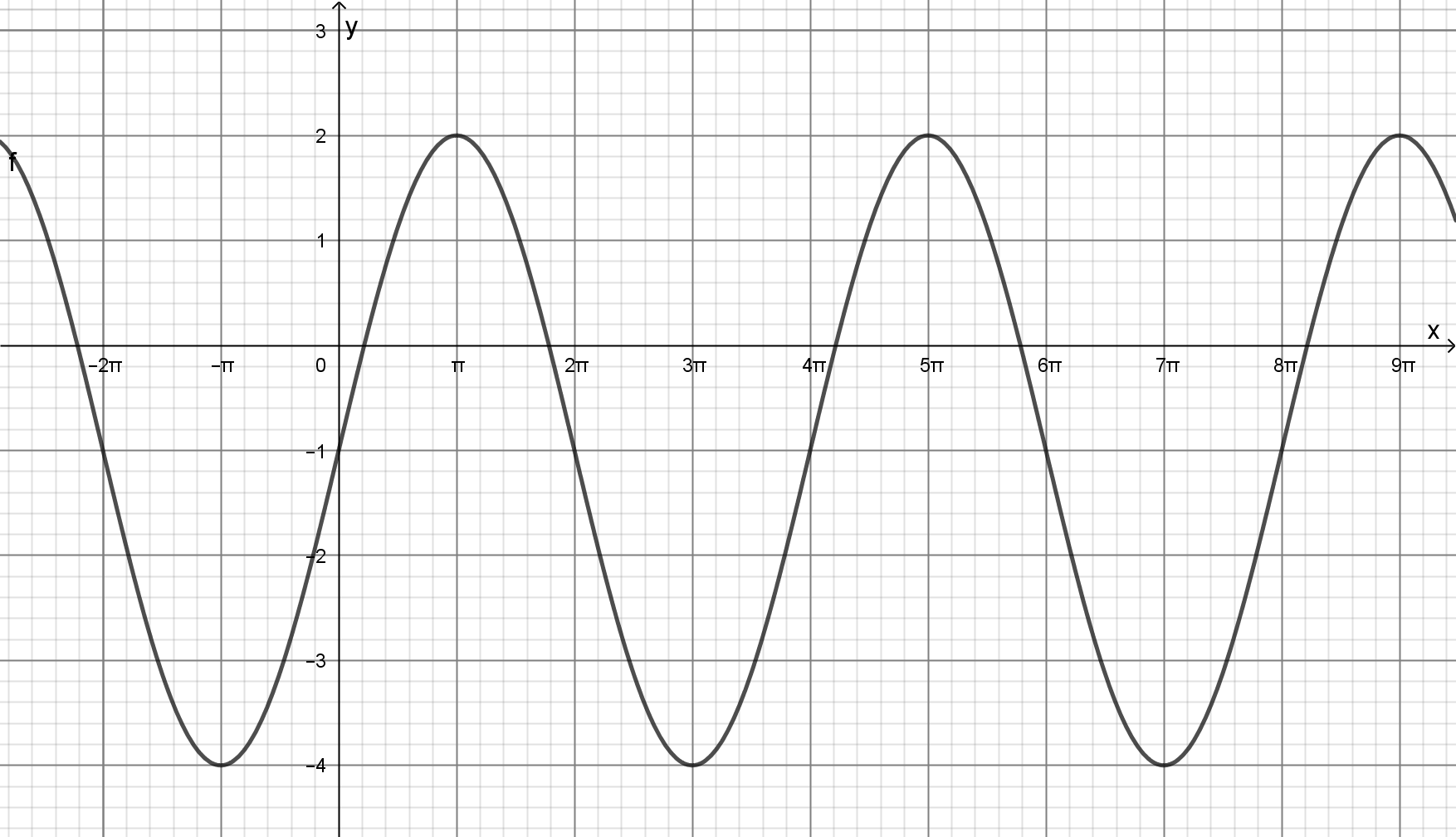
(b) Determine the value(s) of if is singular. (3 marks)

(c) Use a matrix method to determine if . (3 marks)

Question 3 (7 marks)

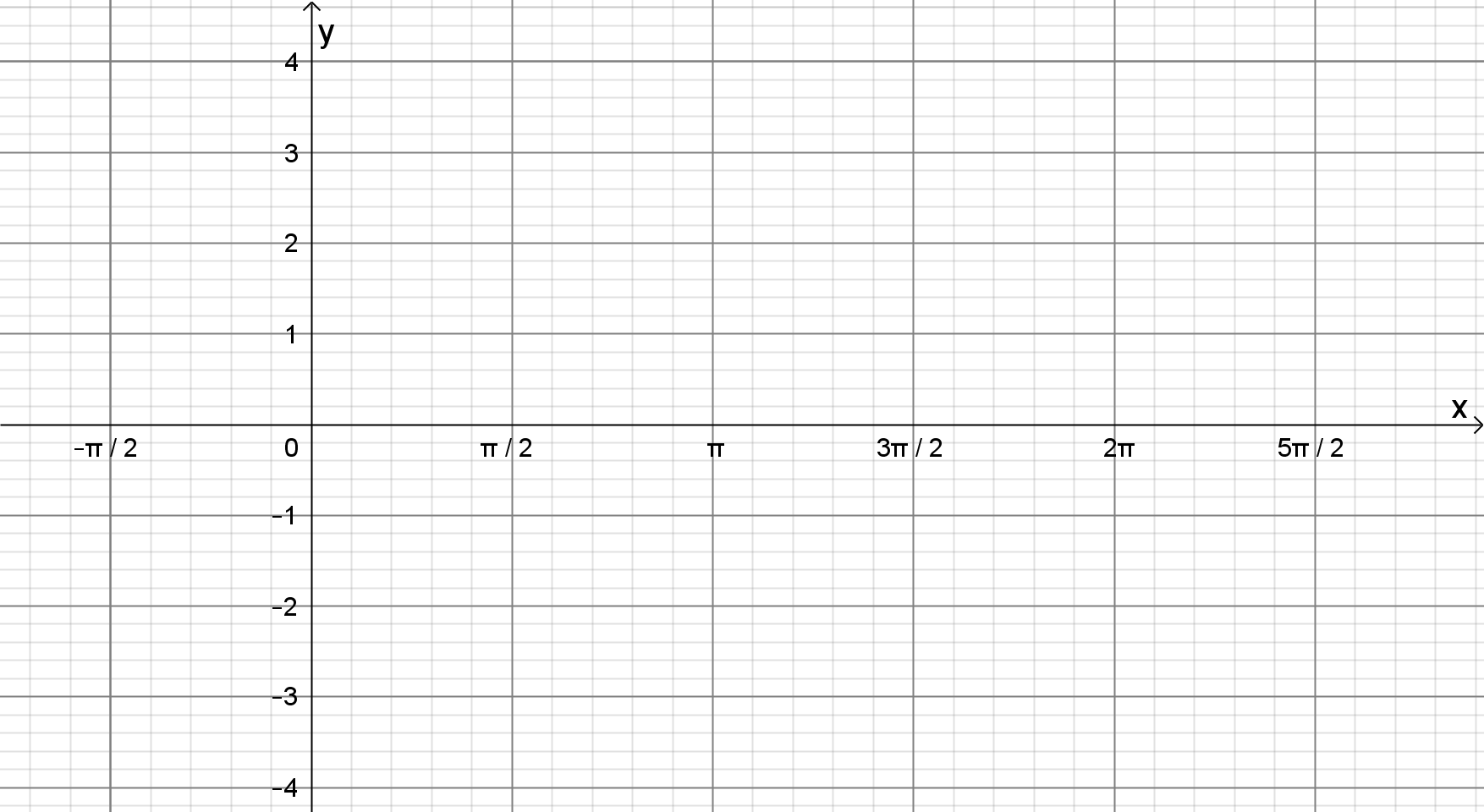
1. Write down the equation of the following graph?

(4 marks)



1. Sketch the graph of on the grid below.

(3 marks)



Question 4 (10 marks)

1. Solve , for

(3 marks)

1. Solve for

(4 marks)

1. Find all the solutions for the equation

(3 marks)

**Section Two : Calculator Assumed 20 Marks**

**Time Allowed 30 minutes Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Question 5

(6 marks)

A system of equations is given by

(a) Let the constant .

(i) Express the system in matrix form , where and are column matrices.

(2 marks)

(ii) Determine and demonstrate use of matrix algebra to solve the system for .

(3 marks)

(b) Determine the value of for which the system has no solution. (1 marks)

Question 6

(7 marks)

The air pressure in a tank can be modelled by the equation

for

where is the pressure in kPa, is the time in hours after midnight and all other variables are positive constants.

The air pressure first reached a minimum of kPa when h and then rose during the next hours to a maximum of kPa before decreasing again.

(a) Determine the value of each of the positive constants and . (4 marks)

(b) Use the model to determine

(i) the air pressure at pm. (1 mark)

(ii) the time of day, to the nearest minute, that the pressure first reached kPa.

(2 marks)

**Question 7**

**[7 marks]**

The Perth Pergola Company manufactures pergolas, sheds and garages. Each item requires a number of nuts, bolts and washers:

Pergolas need 35 nuts, 20 bolts and 10 washers.

Sheds need 70 nuts, 30 bolts and 20 washers.

Garages need 56 nuts, 34 bolts and 18 washers

a) Represent this information in matrix form (2 marks)

The Perth Pergola Company has a manufacturing goal of 20 pergolas, 40 sheds and 35 garages.

b) Use matrix methods to show how many nuts, bolts and washers are needed. (3 marks)

The cost of each nut, bolt and washer is 15c, 25c and 5c , respectively.

c) Use matrix methods to find the how much the of nuts, bolts and washers would cost for the company to reach their goal. (2 marks)