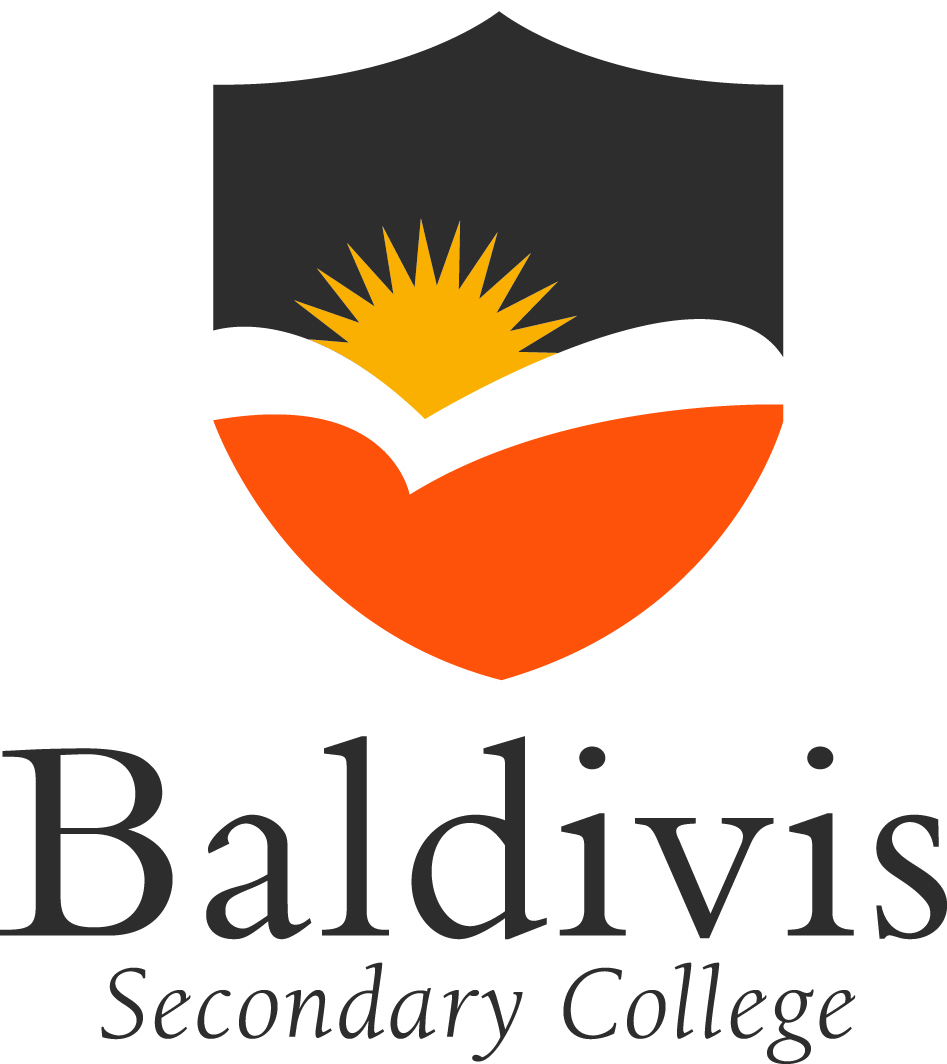
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**Mathematics Specialist Unit 1**

# Test 5

**Matrices**

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

**Task type: Response**

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

Section One: Calculator-free 30 minutes ( 19marks)

Section Two: Calculator-assumed 30minutes ( 30marks)

**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: 60 marks**

**Task weighting: 8.5%**

**Section One : Calculator Free 27 Marks**

**Time Allowed 30 minutes**

**Question 1**

**[7 marks]**

Given that  , and is the identity matrix.

Find

**Question 2**

**[5 marks]**

For the matrices

1. Which pairs of matrices can be added?
2. Write down all the pairs of matrices that can be multiplied.
3. Multiply the two matrices that will give a product that is a square matrix.

**Question 3**

**[4 marks]**

Given vectorsand

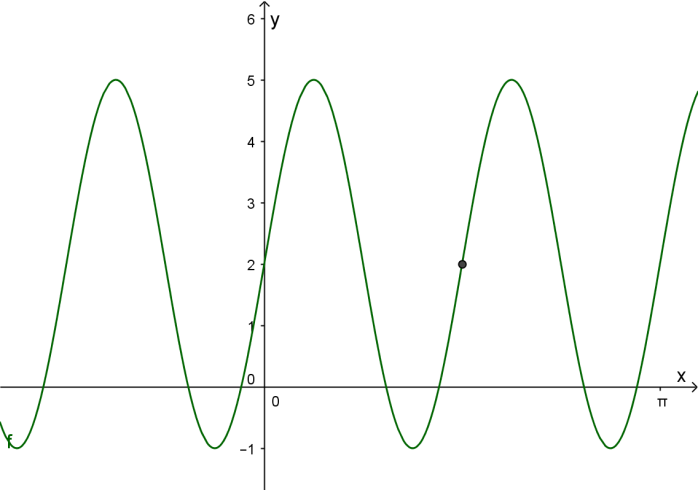
Find

1. Find the vector projection of onto

**Question 4**

**[3 marks]**

Write the equation of the following graph in the form



**Question 5**

**[8 marks]**

1. Rewrite the following in terms of matrix
2. For the non-singular matrices **and** such that **. Show that**

**Section Two : Calculator Assumed 30 Marks**

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

**Question 6**

**[5 marks]**

1. Express in the form for an acute angle in radians.
2. Hence determine the maximum value of and the smallest positive value of at which this occurs.

**Question 7**

**[4 marks]**

A body is acted on by the forces as shown in the diagram.

Find the magnitude and direction of the resultant force.

30°

20 N

15°

30 N

**Question 7**

**[4 marks]**

Consider the system of equations:

a) Write this system as a matrix equation. (2)

b) Solve the system using matrix methods. (2)

**Question 8**

**[4 marks]**

Given that

1. Find, in terms of x, the determinant of matrix**.**
2. Find the greatest value of that makes the matrix singular.

**Question 9**

**[4 marks]**

1. Find the transformation matrix representing a rotation of 30 anti-clockwise about the origin
2. Find the transformation matrix representing a rotation of 45 anti-clockwise about the origin.
3. Hence, find the transformation matrix that represents a 75 anti-clockwise rotation about the origin.

**Question 7**

**[3 marks]**

Use matrices to find the image of the line after it is reflected in the line.

**Question 10**

**[8 marks]**

On a normal Monday’s trading, BRASH’S Melville store sell, on average, 8 televisions, 12 music systems and 6 digital video recorders. In comparison, the Cannington store sells, on average, 4 televisions, 9 music systems and 5 digital recorders.

a) Represent this information as the matrix **S**. (2)

b) The profits ($) on each item can be represented by matrix **P**, where **P** =  (2)

Calculate SP.

What do the entries tell you?

For their MAD MONDAY SALE, profits were reduced by 40% and the following quantities sold.

Melville : 4 televisions, 6 music systems and 10 digital video recorders

Cannington : 5 televisions, 5 music systems and 6 digital video recorders

c) Use matrix operations to determine the overall increase or decrease in profit for the two stores on MAD MONDAY over a normal Monday. (4)