Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

INSTRUCTIONS

Full marks will be awarded for the correct solutions to **ALL QUESTIONS**. This paper will be marked out of a TOTAL MAXIMUM MARK OF 100. Credit will be given for clearly presented solutions.

BSc (Hons) in Computer Games Development

YEAR 1

CLASS TEST 2

1. Let

$$A = \begin{pmatrix} 4 & 0 \\ 1 & 1 \\ 4 & -2 \end{pmatrix} \qquad B = \begin{pmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \end{pmatrix}$$

Determine each of the following

i $3A + B^t$

ii AB

20 marks

2. Let

$$A = \begin{pmatrix} -5 & 1 & 4 \\ -1 & 1 & 1 \\ -4 & 1 & 3 \end{pmatrix}$$

By a sequence of *row operations* find A^{-1}, the *inverse* of A.
Confirm your work by showing that $A^{-1}A = I$, where I is the identity matrix.

40 marks

3. Let $T_A : \mathbb{R}^2 \longrightarrow \mathbb{R}^2$ such that

$$T(x) = [A]x$$

denote a *matrix transformation* with *standard matrix* A. The *standard matrix* required to rotate a point *anti-clockwise* about the origin in $\mathbb{R}^2$ is given as

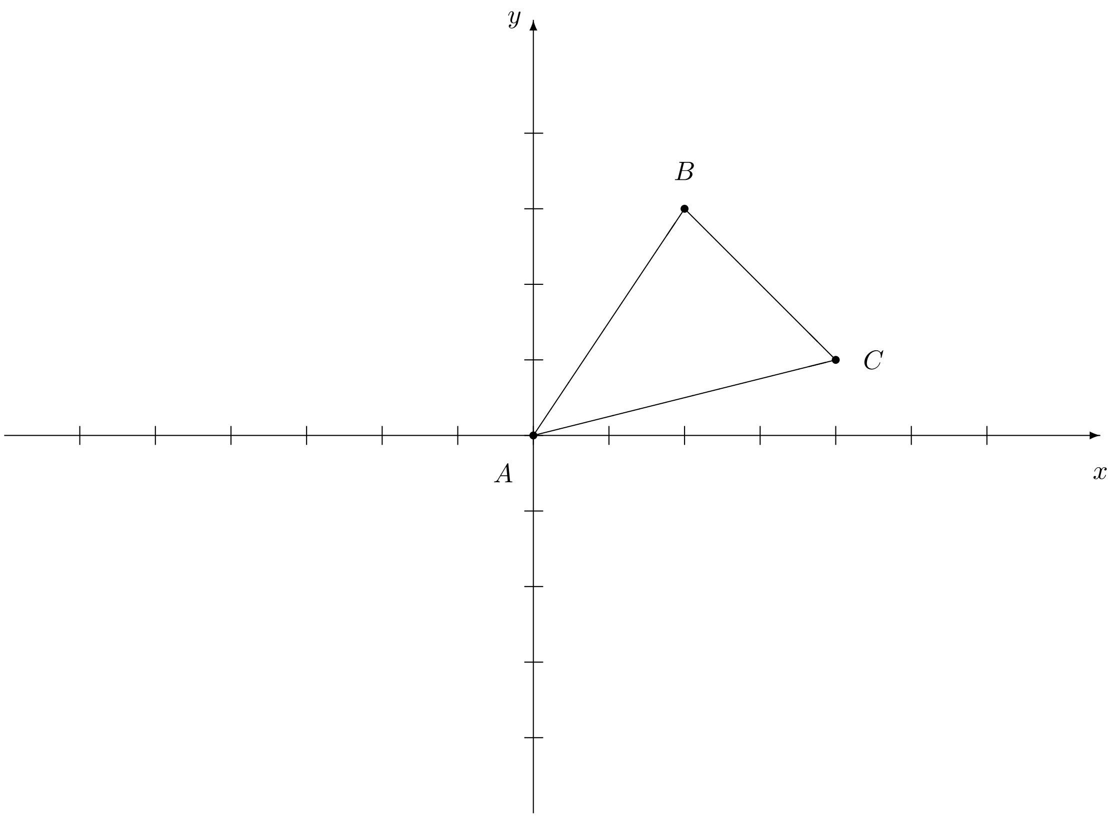
$$A = \begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$$

Rotate the triangle ABC whose vertices are the points $A(0,0)$, $B(2,3)$, $C(4,1)$

i 90^o *anti-clockwise* about the origin,

ii 180^o *anti-clockwise* about the origin.

Illustrate each rotation on this simple graph.



An *orthogonal* matrix is one where the *standard matrix* A satisfies the condition $A^{-1} = A^t$. The *standard matrix A* required to rotate a point *anti-clockwise* about the origin in $\mathbb{R}^2$ will be *orthogonal*. This will ensure that magnitudes and angles will be preserved as a result of the transformation. Choose just **ONE** of the matrices from part i or ii above and show that it is *orthogonal*.

40 marks

NAME: ______________________________