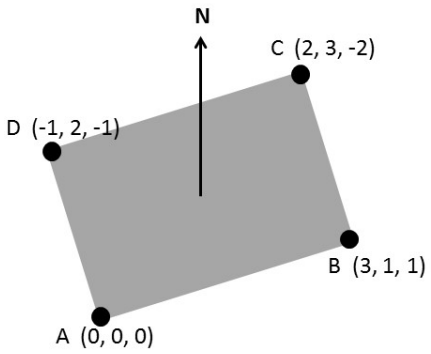
The University of Jordan
King Abdulla II School for Information Technology
Computer Science Department

Computer Graphics – MidTerm Exam – Fall 2014/2015 **Instructor: Dr Jamal Alsakran**

Student Name: **Student ID:**
Section #:

Q1 (3 points, 2 + 1) Given the following polygon composed of the points A, B, C, and D.

(a) Calculate the normal direction **N**



(b) Normalize **N**

Q2 (12 points, 2 each) Answer each of the following questions

(a) Given a circle center at (0, 0) of radius r = 10, using Midpoint circle algorithm compute P_0:

P_0 =

(b) Given the line with endpoints (40, 50) and (20, 0), compute the line slope:

slope =

(c) For any given shape centered at ***(cx, cy)***, provide the transformation matrix ***M*** that makes the shape twice as big and stays centered at the same point ***(cx, cy).***

M =

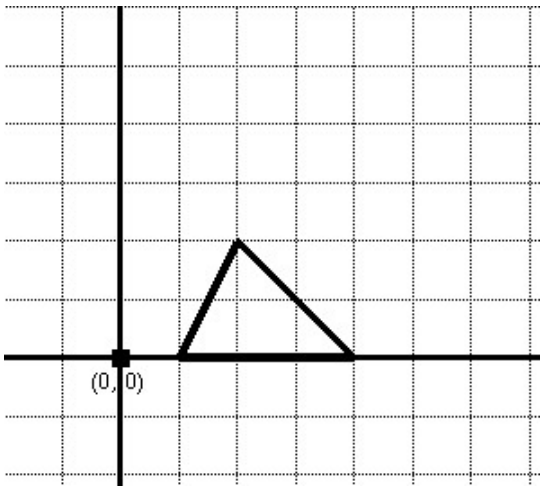
(d) For any given shape, what will happen to the shape when the matrix M = $\begin{bmatrix} \mathbf{1} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{1} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \mathbf{1} \end{bmatrix}$ is applied to it?

(e) Let ***A*** and ***B*** be unit vectors and ***A.B = 0***, what is the angle ***θ*** between **A** and **B**

θ =

(f) Draw a concave polygon. What is the smallest number of vertices possible for a concave polygon?

Q3 (10 points, 2 each) Given the figure below that shows a shape in its initial position



and the transformations:

$T(t_x, t_y)$ ➔ Translation matrix
$S(s_x, s_y)$ ➔ Scaling matrix
$R(\theta)$ ➔ Rotation matrix

(a) Draw the shapes that result from applying the following transformations to the initial shape above.

T(1, -1) . R(90)	
S(1, 2) . T(-1, 0)	

T (1, 0) . R(360) . T (-1, 0)	

(b) Write down the matrix M (in symbolic form) to perform the transformation required to generate the figures below.