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CS460 - Assignment 2
Part A

Q1 Answer:

Transformation Matrix = R ($\boldsymbol{\theta}$) * T (x_0, y_0)
= R $(45°)$ * T (x_0, y_0)

$$\text{Transformation Matrix} = \begin{bmatrix} x_0 * \cos(45) + y_0 \sin(45) \\ -x_0 * \sin(45) + y_0 \cos(45) \\ 1 \end{bmatrix}$$

Q2 Answer:

Transformation: Rotate point P 180 degrees relative to the line QQ'

Q3 Answers:

3a)

3a) $T(-1,0)\ S(1/2, 1/4)\ R(90°)\ Rf(y,-x)$

$A=(2,0),\ B=(4,0),\ C=(2,4)$

$ABC \xrightarrow{Rf(y,x)} A'=(0,2),\ B'=(0,4),\ C'=(4,2)$

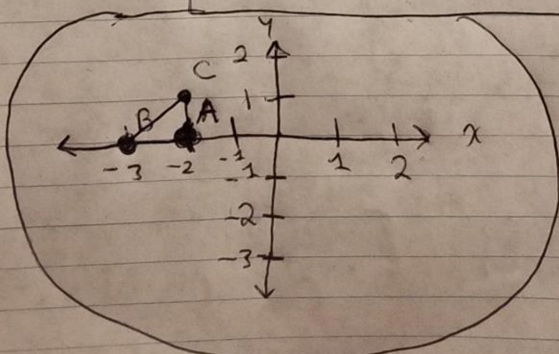
$A'B'C' \xrightarrow{R(90°)} A''=(0*\cos(90)-2\sin(90),\ 0*\sin(90)+2*\cos(90)) = (-2,0)$

$B''=(0*\cos(90)-4*\sin(90),\ 0*\sin(90)+4*\cos(90)) = (-4,0)$

$C''=(4*\cos(90)-2\sin(90),\ 4*\sin(90)+2*\cos(90)) = (-2,4)$

$A''B''C'' \xrightarrow{S(1/2,1/4)} A'''=(-1,0)\ \ B'''=(-2,0)\ \ C'''=(-1,1)$

$A'''B'''C''' \xrightarrow{T(-1,0)} \boxed{A=(-2,0)\ \ B=(-3,0)\ \ C=(-2,1)}$



3b)

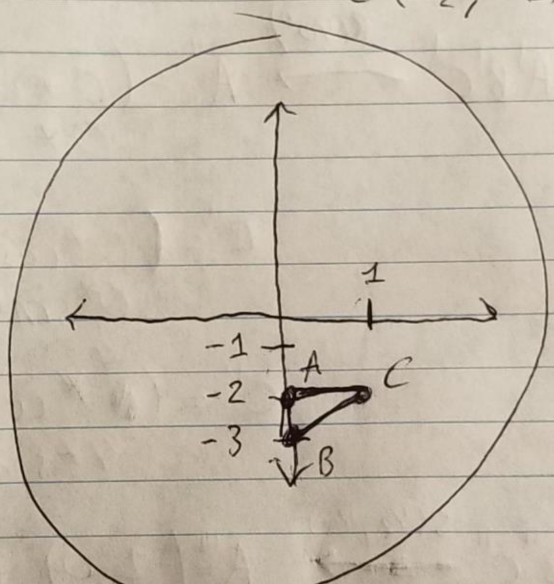
b) $R(90^\circ)\ T(-1,0)\ S(1/2, 1/4)\ Rf(y,-x)$

$ABC \xrightarrow{Rf(y,-x)}$ $A(-2,0)$, $B(-4,0)$, $C(-2,-4$ $\xrightarrow{S(1/2,\,1/4)}$ $A(-1,0)$, $B(-2,0)$, $C(-1,-1)$

$\xrightarrow{T(-1,0)}$ $A(-2,0)$, $B(-3,0)$, $C(-2,-1)$

$\xrightarrow{R(90^\circ)}$ $A(-2\cos 90, -2\sin 90)$, $B(0,-3)$, $C(1,-2)$

$\boxed{A(0,-2),\ B(0,-3),\ C(1,-2}$



Q4 Answer:

Let Xmin = 2, Ymin = 2, Xmax = 6, Ymax = 6.

Viewport 1:

Let Umin = 1, Vmin = 3, Umax = 3, Vmax = 6.

Then using the formula

ViewportX = ($X - Xmin$**) * (**$\frac{Umax - Umin}{Xmax - Xmin}$**)** $+ Umin$

ViewportY = ($Y - Xmin$**) * (**$\frac{Vmax - Vmin}{Ymax - Ymin}$**)** $+ Vmin$

Where X and Y correspond to the coordinates of A, B, and C.

Final Coordinates: A' = (1.5, 5.25) B' = (2, 6.25) C' = (2.5, 4.5)

Viewport2:

Let Umin = 1, Vmin = 3, Umax = 3, Vmax = 6.

Then using the formula

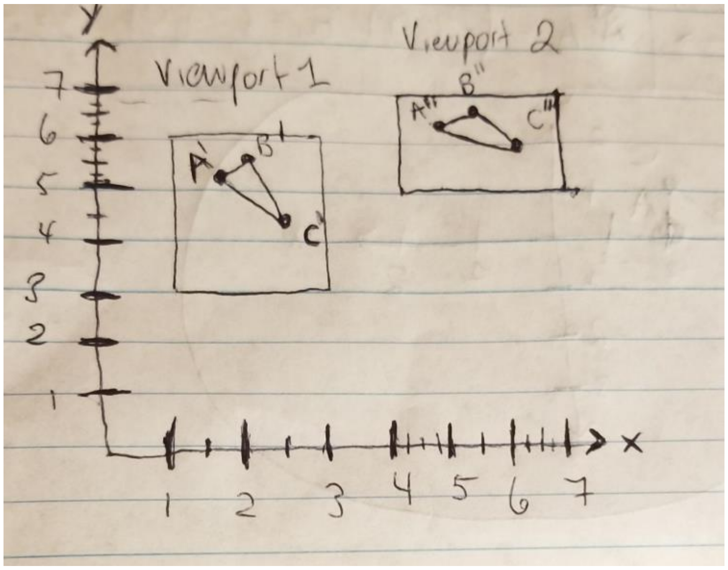
ViewportX = ($X - Xmin$**) * (**$\frac{Umax - Umin}{Xmax - Xmin}$**)** $+ Umin$

ViewportY = ($Y - Xmin$**) * (**$\frac{Vmax - Vmin}{Ymax - Ymin}$**)** $+ Vmin$

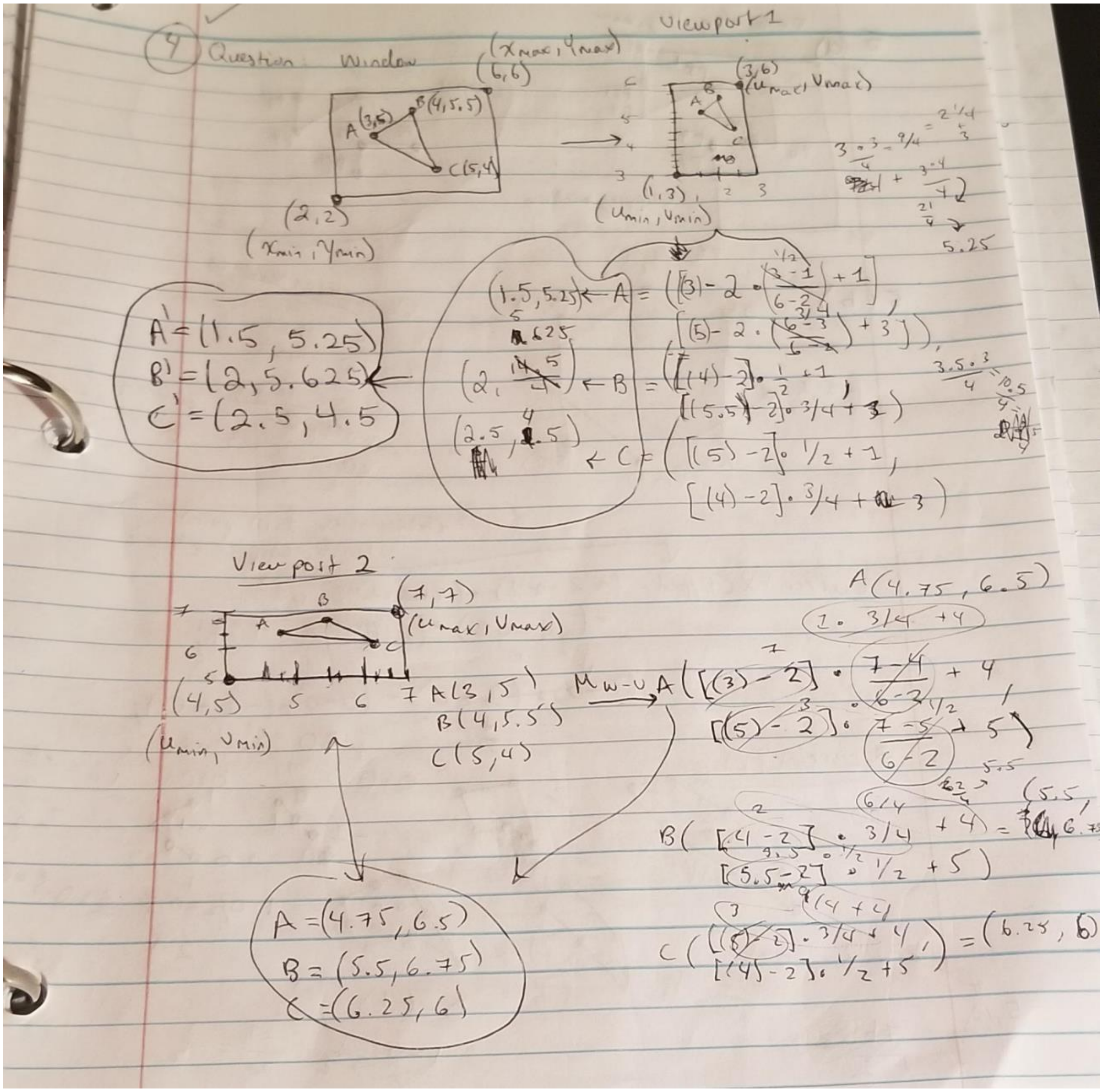
Where X and Y correspond to the coordinates of A, B, and C.

Final Coordinates: A'' = (4.75, 6.5) B'' = (5.5, 6.75) C'' = (5.625, 6)

Question 4 Graphs of A’B’C’ and A’’B’’C’’ in Viewport1 and Viewport 2:

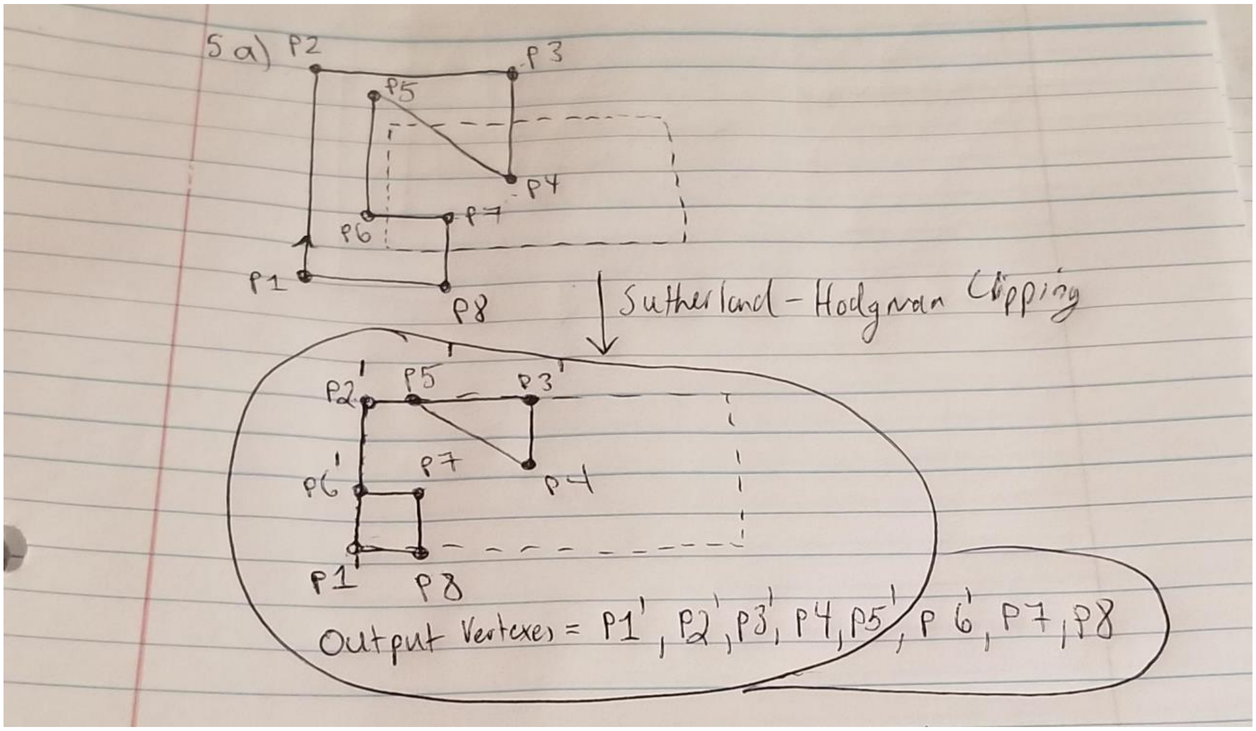


Question 4 Original Work:



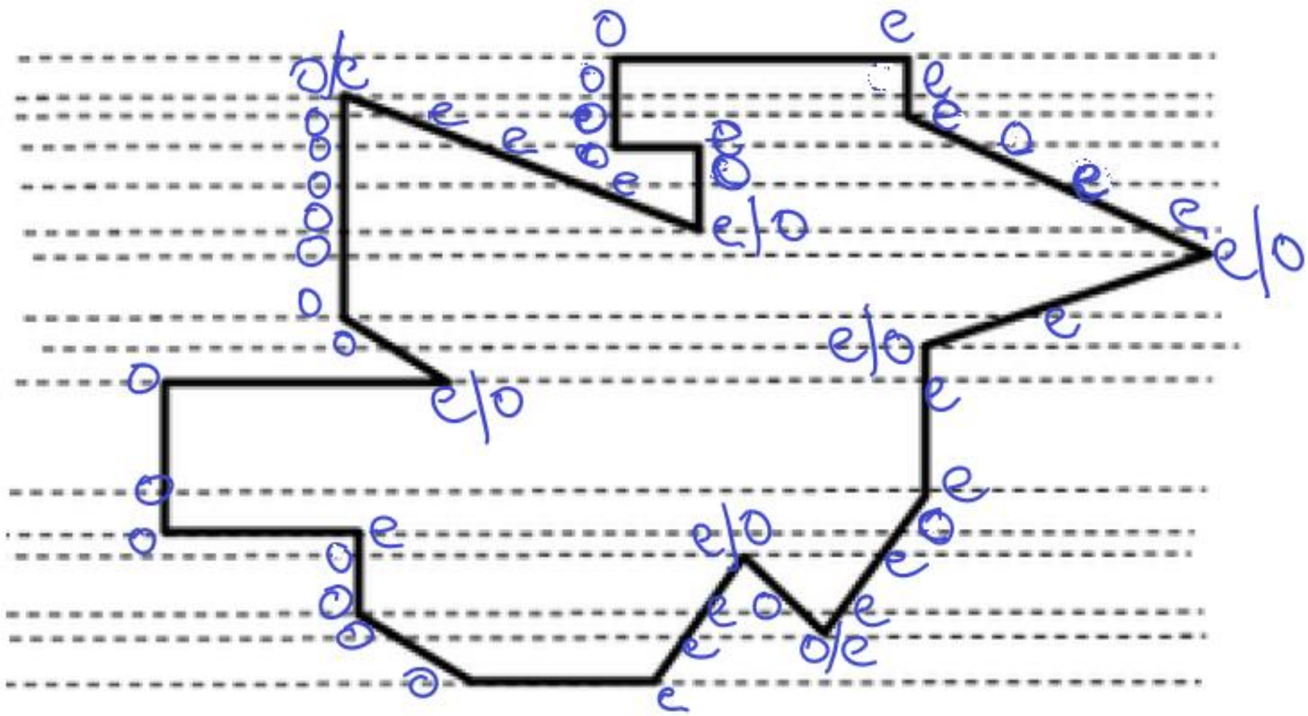
Q5 Answers:

5A)



Q5 B Answer: (skipped)

Q6 Answer:



Q7 Answer: Skipped