CS 174A: Assignment 1 (Written)
Spring 2014 (Prof. M. Alex Vasilescu)

Exercise 1

$p_A = 2i - 2j$
$p_B = 3i + 0.5j$
$p_C = -4i + 3j$

Exercise 2

M= [1 0 0 0]
[0 2 0 0]
[0 0 3 0]
[0 0 0 1]

Exercise 3

modelMatrix *= Translate(1, 1, 1);
modelMatrix *= Scale(1, 1, 2);

Exercise 4

$[0.5 \;\; 2.5 \;\; 2]^T$

Exercise 5

//PartA
M= [1 0 0 2]
[0 1 0 3]
[0 0 1 0]
[0 0 0 1]

//PartB
M= [0 0 1 2]
[0 1 0 3]
[-1 0 0 0]
[0 0 0 1]

//PartC
M= [0 0 1 2]
[0 0.5 0 3.5]
[-1 0 0 -1]
[0 0 0 1]

//PartD
M= [0 0 1 2]
[0 1 0 3]
[-2 0 0 0]
[0 0 0 1]

Exercise 6

Let line be parameterized as: y=m*x+b.

M=Translate(0,b)*Rotate(theta)*Scale(1,-1)*Rotate(-theta)*Translate(0,-b)

where theta = arctan(m).

$$M = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & b \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -b \\ 0 & 0 & 1 \end{bmatrix}$$

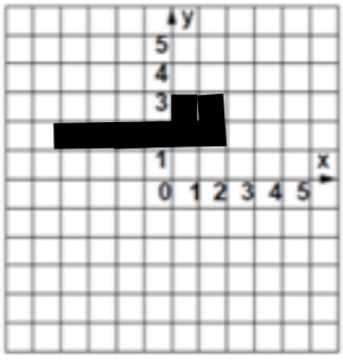
OpenGL Shader Code:

```
mat4M(1.0f);//Identity
M*=Translate(0,b,0);//AssumeusingX,Yplaneonly(2D)
M*=RotateZ(theta);
M*=Scale(1,-1,1);
M*=RotateZ(-theta);
M*=Translate(0,-b,0);
```

Exercise 7

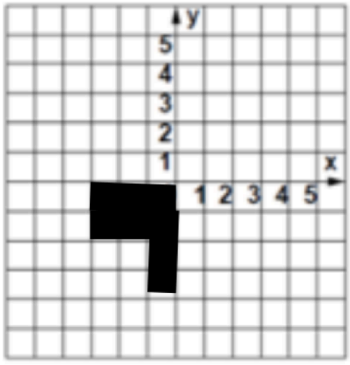
```
#define A modelMatrix *= Scale(2, 1, 1);
#define B modelMatrix *= Translate(1, 1, 0);
#define C modelMatrix *= RotateZ(90);
#define D modelMatrix *= Scale(-1, 1, 1);
#define X model_view = view_trans * model_trans;
```

a) L' = ABC L



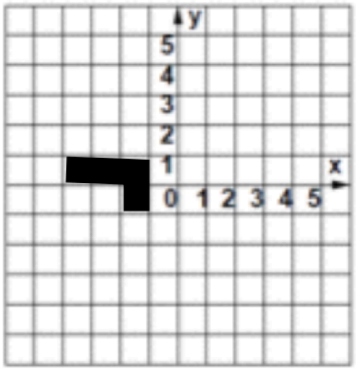

```
A
B
C
X
drawL();
```

b) L' = CAD L



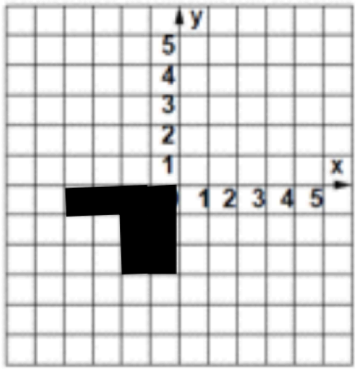

```
C
A
D
X
drawL();
```

c) L' = CBD L




```
C
B
D
X
drawL();
```

d) L' = DCCAD L




```
D
C
C
A
D
X
drawL();
```