

CS4204 Computer Graphics Spring 2010 Homework Assignment 2

Assignment 2 is due on Tuesday, 2/9/2010 12:30pm. You need to turn your homework in to your instructor before class start. Please write clearly on paper.

Note: There are 10 points for each question.

Q1. Viewport transform is a 2D transformation that maps normalized device coordinate system on to window coordinate system. What is the 2D transformation matrix for the following OpenGL command?

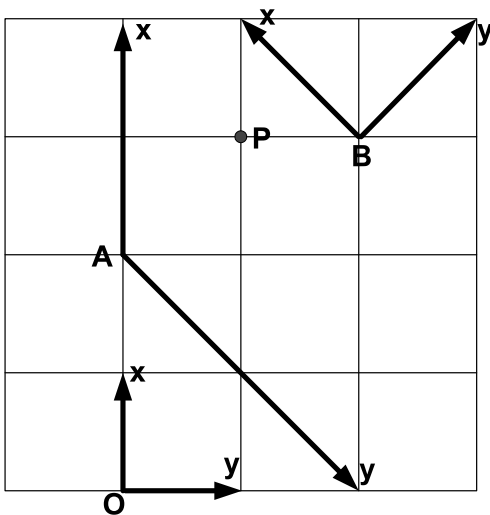
```
glViewport( 20, 30, width/3, height*1.5 );
```

Q2. Please explain when windows reshape callback event happens. And display callback event?

Q3. What is the 2D transformation matrix for rotate 60 degree around point (-1, 2)?

Q4. Let's represent 2D translation as $TR(x,y)$, rotation as $R(\theta)$, scale as $S(s_x, s_y)$. Please write down the series of transformations produces the reflection of a two dimensional point about an arbitrary line $y = 3x+5$? Show the 2D transformation matrix (using homogeneous coordinate system) of this transformation.

Consider the following three coordinate systems (O, A, B) for questions 5-8:



Notation: M_{ST} is a 3x3 homogeneous matrix that transforms points from coordinate system S to coordinate system T .

Q5. What are the coordinates of P in coordinate system \mathbf{O} ?

Q6. What are the coordinates of P in coordinate system \mathbf{A} ?

Q7. What are the coordinates of P in coordinate system \mathbf{B} ?

Q8. What is the matrix of \mathbf{M}_{AB} ? Please show the detail of derivation.

Q9. Express \mathbf{M}_{OB} in terms of \mathbf{M}_{AO} and \mathbf{M}_{BA} .