Homework 2 - Readings Ch3 (91-113) & Ch4

1. Given a point $p(x, y, z)$ and the point $p'(x', y', z')$ where $p'(x', y', z')$ is the point $p(x, y, z)$ translated by Tx, Ty, Tz:

   (a) Show the **equations** to compute p' from p.

   p'(x',y',z') =[Tx,Ty,Tz]* p(x,y,+z)

   (b) Show the 4x4 **transformation matrix** to compute p' from p.

   [1 0 0 Tx] px px'
   [0 1 0 Ty] * py = py'
   [0 0 1 Tz] pz pz'
   [0 0 0 1] 1 1

2. Given a point $p(x, y, z)$ and the point $p'(x', y', z')$, where $p'(x', y', z')$ is the β degree rotated point of $p(x, y, z)$ around the z-axis:

   (a) Show the **equations** to compute p' from p.

   p'(x',y',z') =R_z(β)* p(x,y,+z)

   (b) Show the 4x4 **transformation matrix** to compute p' from p.

   [cos(β) -sin(β) 0 0] px px'
   [sin(β) cos(**β**) 0 0] * py = py'
   [0 0 1 0] pz pz'
   [0 0 0 1] 1 1

3. Given a point $p(x, y, z)$ and the point $p'(x', y', z')$, where $p'(x', y', z')$ is the point $p(x, y, z)$ scaled by Sx, Sy, Sz :

   (a) Show the **equations** to compute p' from p.

   p'(x',y',z') =S_x,y,z* p(x,y,+z)

   (b) Show the 4x4 **transformation matrix** to compute p' from p.

   [Sx 0 0 0] px px'
   [0 Sy 0 0] * py = py'
   [0 0 Sz 0] pz pz'
   [0 0 0 1] 1 1

4. What is a model matrix? Write a simple vertex shader that uses a model matrix. Explain your shader.

A model matrix is a matrix that can calculate the Translation, Rotation, and Scale to all the verticies in our world.

```
var VSHADER_SOURCE =
 'attribute vec4 a_Position;
 uniform mat4 u_ModelMatrix;
 void main() {
  gl_Position = u_ModelMatrix * a_Position;
 '}';
```

The shader above takes a postion out a vertex and will translate, rotate, and scale when called in js program