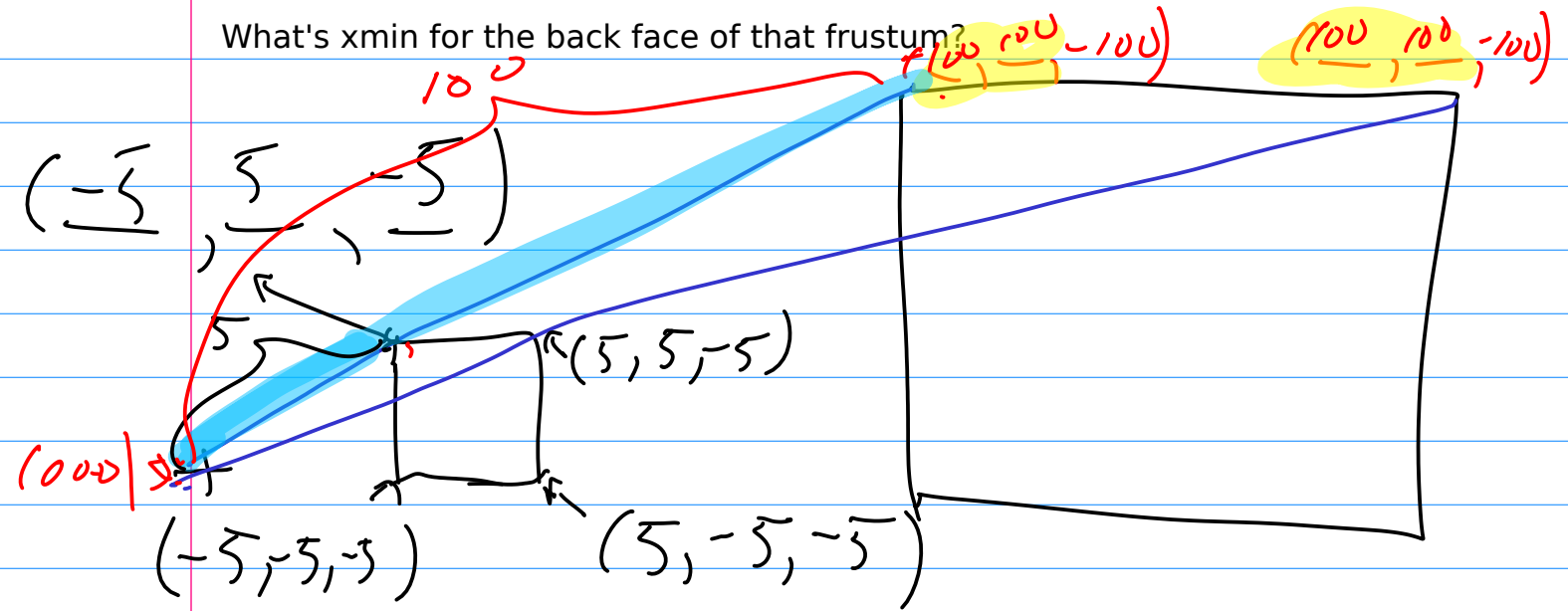
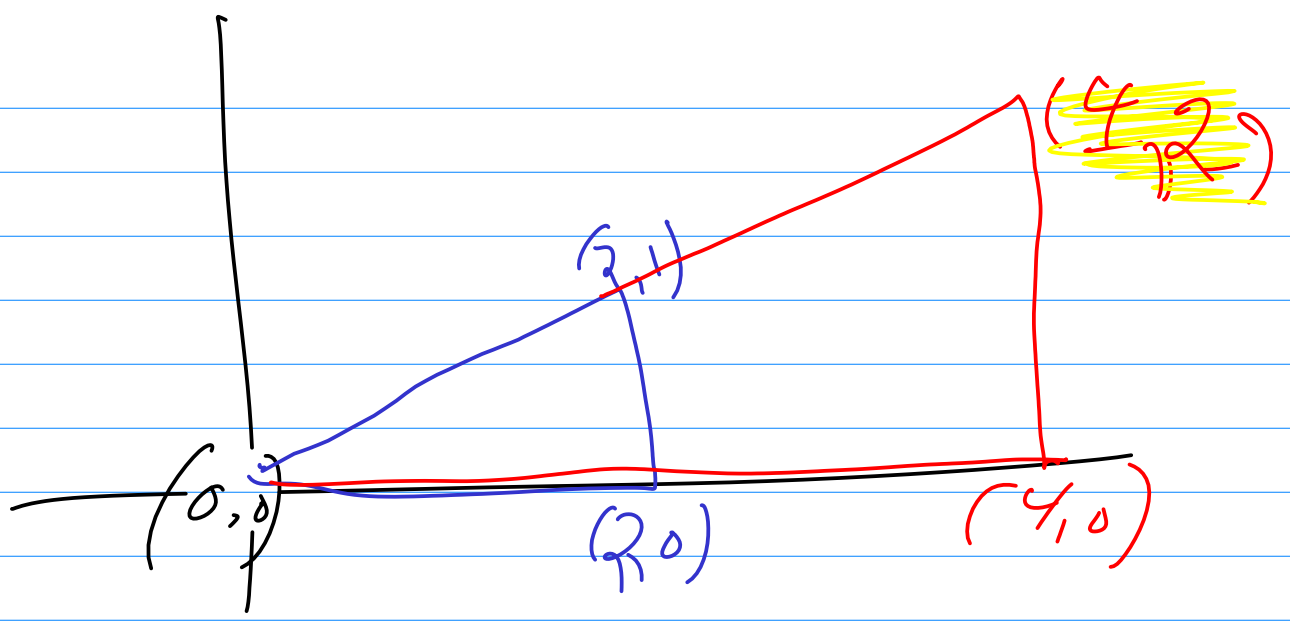


Textbook is available from Amazon 1-day shipping with free Prime. \$90 incl shipping.

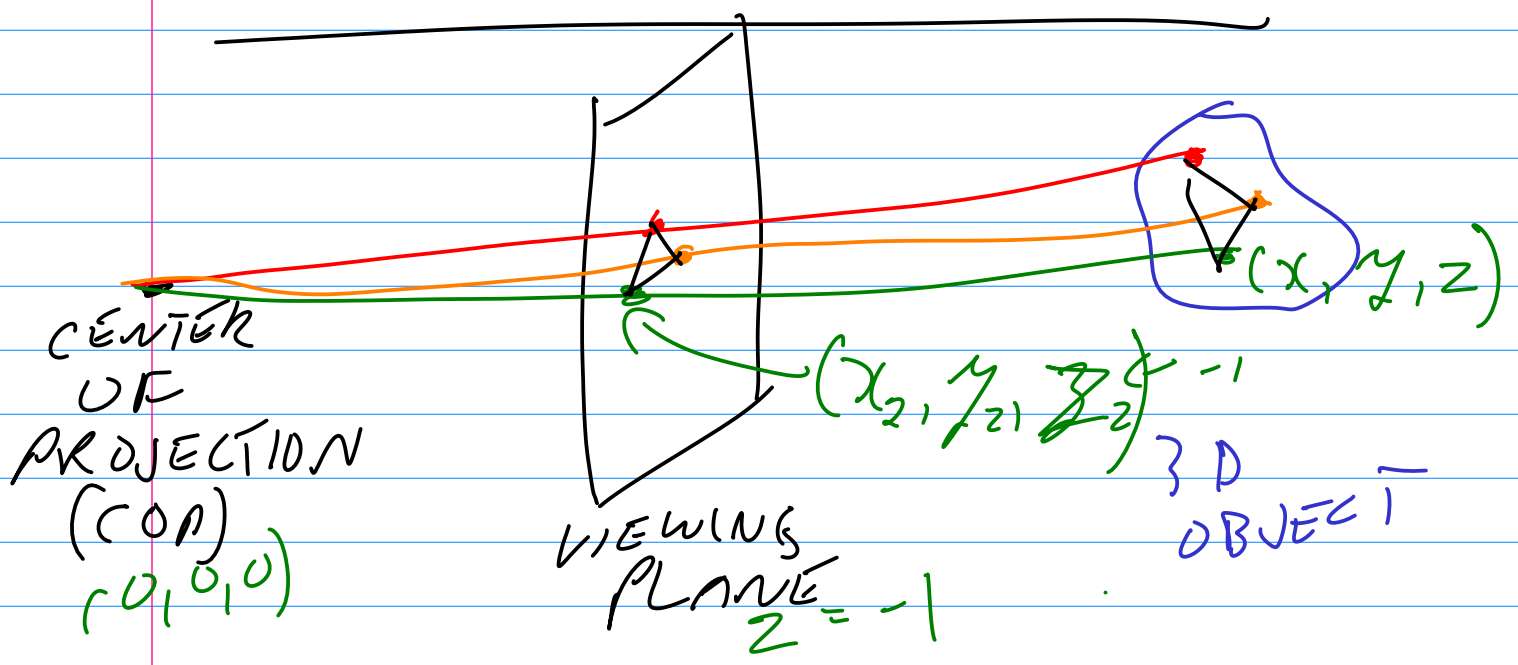
```
glFrustum(-5.,5.,-5.,5.,5.,100.);
```

What's xmin for the back face of that frustum?





PROJECTION PREVIEW



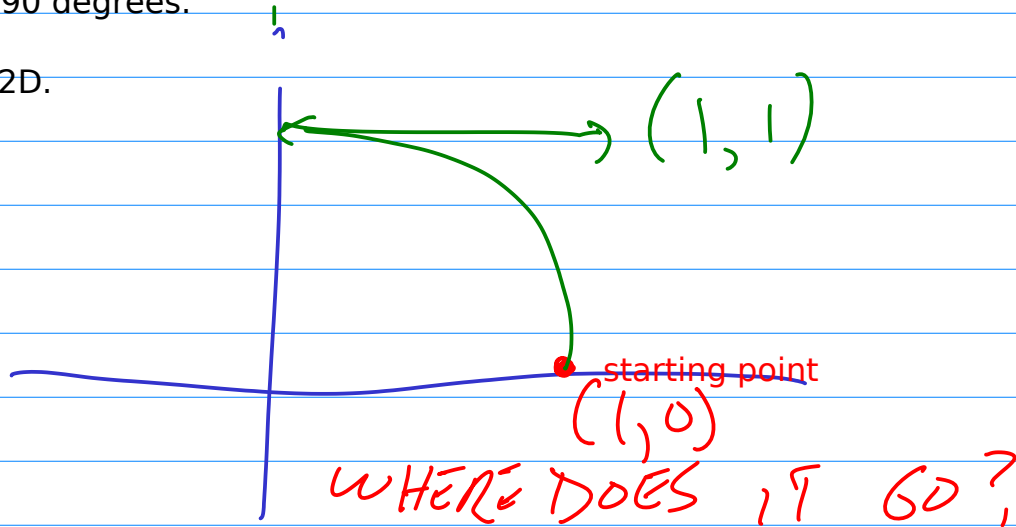
We project the 3D point (x,y,z) onto the viewing plane whose equation is $z = -1$. So the projected point (x_2, y_2, z_2) has $z_2 = -1$. Use similar triangles to find x_2, y_2 .

Transformation composition (combining)

EVEN
BOTH
(IN
OPEN

Translate by (1,0)
Rotate by 90 degrees.

Do this in 2D.



M - MODEL VIEW MATRIX

$$\left. \begin{matrix} \text{TRANSLATE} \\ \text{ROTATE} \end{matrix} \right\} : M' = M \circ T$$

WITH 3 TRANSFORMS T_1, T_2, T_3

$$M' = M T_1 T_2 T_3$$

WHEN MULTIPLIED, VERTEX v IS ON RIGHT

$$v' = M'v = M T_1 T_2 T_3 v$$

OPENGL PROB

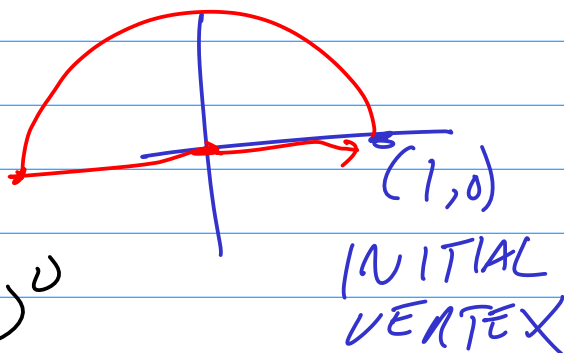
4

- TRANS BY $(1, 0)$

- ROTATE BY 90°

- TRANS BY $(1, 0)$

- ROTATE BY 180°



WHAT IS VERTEX'S FINAL POSITION?
 $(1, 0)$

When drawing a hierarchical object like a robot, where there are a sequence of parts, each at a relative position to another part, you modify the modelview matrix in between drawing parts.

Finally, new stuff.

More efficient ways to draw lots of vertices.

Load a lot of vertices into an array, set things up and then draw all with one call.

This starts looking like a vertex buffer object (VBO).

v2 is better than v1 (squareAnnulus*.cpp) because it's

- easier to read
- easier to change.