Assignment 4

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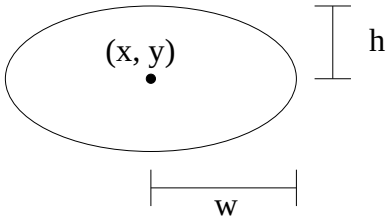
Due Mar. 11

Each of the following four problems is worth five points.

1. Consider the unit circle centered at the origin. It has symmetries about the x-axis, the y-axis, and the line $y = x$. The algorithm we looked at for generating vertices for rendering such a circle makes a lot of calls to the `sin()` and `cos()` functions, calls that are very expensive, time-wise. Explain how a circle's symmetries can be exploited to reduce the number of such calls by a factor of eight.

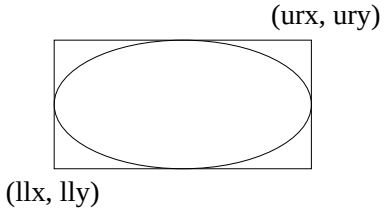
2. You have a function that generates the vertices for drawing an ellipse given the four parameters shown in this figure:



   Assume that this function is declared as follows:

```
genEllipse(GLfloat x, GLfloat y, GLfloat w, GLfloat h);
```

   Use this function to write a function that generates the vertices for drawing an ellipse given these four parameters:



3. In Lab 3, you experimented with a primitive figure drawing tool. Let's say you wanted to add a tool to delete a displayed polygon. Discuss the pros and cons of using bounding boxes to assist in pick selecting the polygon to be deleted.

4. Show the following:

   (a) Vector addition is commutative.

   (b) Matrix-matrix multiplication is not commutative. (For simplicity, consider 2×2 matrices.)