

CSci 490, Spring 2005, Quiz 1

Name: _____

1. [6 pts] Suppose we are performing a perspective projection onto a vertical screen one foot square which is one foot away from the eye. Eighty feet away in the same direction, there is a wall ten feet high. If the screen is 200×200 pixels, how many pixels high will the wall appear on the screen?
2. [6 pts] Give a single matrix that represents rotating a point 90° around the z -axis and then shifting it 3 units up the z -axis. Thus, your matrix should transform $(0, 1, -1)$ to $(1, 0, 2)$ and $(1, 0, 4)$ to $(0, -1, 7)$.
3. [10 pts] The following code draw a line from (x_0, y_0) to (x_1, y_1) (both points being given in window coordinates), where $x_0 < x_1$, $y_0 < y_1$, and $H < W$ where $H = y_1 - y_0$ and $W = x_1 - x_0$.

```
public static void drawLine(int x0, int y0, int x1, int y1) {
    int W = x1 - x0;
    int H = y1 - y0;
    double error = 0.0;
    int y = y0;
    for(int x = x0; x <= x1; x++) {
        drawPixel(x, y);
        error += (double) H / W;
        if(error > 0.5) {
            y++;
            error -= 1.0;
        }
    }
}
```

Bresneham's line-drawing algorithm is similar, but it changes this code in some small ways. Make these changes to the above code, and explain why these changes are significant to Bresneham's algorithm.

4. [8 pts] Suppose we have a plane represented by a vector H , where $H \cdot P = 0$ for each point P in homogeneous coordinates on the plane. Describe an algorithm that, given two points A and B on both sides of the plane, find the point on the segment \overline{AB} that is on the plane represented by H .