

Solutions, CSci 490, Spring 2005, Quiz 1

1. 25 pixels. [The projection of the wall onto the screen would be 1/8 feet tall, since the distance:height ratio would be the same both for the wall (80:10) and for the projection of the wall onto the screen (1:y). This is 1/8 of the height of the screen.]

2.

$$\begin{pmatrix} 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

3. The idea of Bresneham's algorithm is to avoid the floating-point arithmetic involved in maintaining error. We can do this easily by scaling error by a factor of 2W.

```
public static void drawLine(int x0, int y0, int x1, int y1) {
    int W = x1 - x0;
    int H = y1 - y0;
    int error = 0;
    int y = y0;
    for(int x = x0; x <= x1; x++) {
        drawPixel(x, y);
        error += 2 * H;
        if(error > W) {
            y++;
            error -= 2 * W;
        }
    }
}
```

[Traditionally, Bresneham's algorithm also involves translating `error` downward by W units, so that the `if` statement involves evaluating whether an integer is positive, which is easier than comparing it to another integer. This change, though, is less significant.]

4. The point is $tA + (1 - t)B$, where

$$t = \frac{-H \cdot B}{H \cdot A - H \cdot B}.$$