

Consider the following MATLAB program:

```
n = 100000;

x = randn(n,1);
y = randn(n,1);

t = (1 - x) ./ y;

w = x + t .* y;

disp(sprintf('Proportion equal to 1 is %f', sum(w==1)/n))
disp(sprintf('Proportion > 1 is %f', sum(w > 1)/n))
disp(sprintf('Proportion < 1 is %f', sum(w < 1)/n))
```

Here is the output from it:

```
Proportion equal to 1 is 0.817100
Proportion > 1 is 0.054910
Proportion < 1 is 0.127990
```

- (a) Why isn't every component of w equal to 1?
- (b) What does this have to do with Homework 2?
- (c) Consider the cube centered at $\mathbf{0}$ with a vertex at $[1, 1, 1]$. Given a point \mathbf{a} on the surface of the cube and a direction \mathbf{d} that is not parallel to the face that \mathbf{a} lies in, give a reliable MATLAB code to find a point $\mathbf{c} = \mathbf{a} + t\mathbf{d}$ that lies on another face of the cube.