Quiz 11: CS4640 Name _____

1. Given the line defined by:

$$-0.707x - 0.707y + 1 = 0$$

1a. Show how to use the equation to find a point on the line.

Either use [-ca;-cb] = [0.707;0.707] or set $x = 0$ and solve for y:

$$y = 1/0.707 = 1.414$$

1b. Show how to use the coefficients of the line to get a second distinct point on the line at unit distance from the first.

Rotate (say clockwise) the normal ($[-0.707; -0.707]$) to get the direction along the line ($[-0.707; 0.707]$) and add that to the previous point:

$$[0.707; 0.707] + [-0.707; 0.707] = [0; 1.414]$$

1c. Give a parametric equation in one variable, t, for the line:

$$L(t) = [x(t), y(t)]^T$$

Using the ideas of 1a and 1b, any point on the line can be reached by starting at $[0.707; 0.707]$ and moving in the positive or negative direction found in 1b:

$$L(t) = [0.707; 0.707] + t[-0.707; 0.707]$$

2. Give the first derivative with respect to t for the line in 1c.

$$L'(t) = [-0.707; 0.707]$$

Note this could also be $L'(t) = [0.707; -0.707]$.

3. Give a robust Matlab function to produce an initial set of snake points arranged as a rectangle as indicated in the function header.

```
function [x,y] = CS4640_ac_initial_box(r1,c1,r2,c2)
% CS4640_ac_initial_box - initialize rectangular snake points
% On input:
%     r1 (int): upper left corner row
%     c1 (int): upper left corner col
%     r2 (int): lower right corner row
%     c2 (int): lower right corner col
% On output:
%     x (kx1 vector): x coordinates of snake points
%     y (kx1 vector): y coordinates of snake points
% Call:
%     [x0,y0] = CS4640_ac_initial_box(5,5,25,25);
%% Author:
%     <Quiz Taker>
%     UU
%     Spring 2018
%

x1 = [r1:gap:r2];
x1 = reshape(x1,length(x1),1);
y1 = c1*ones(length(x1),1);

y2 = [c1+1:gap:c2];
y2 = reshape(y2,length(y2),1);
x2 = r2*ones(length(y2),1);

x3 = [r2-1:-gap:r1];
x3 = reshape(x3,length(x3),1);
y3 = (c2)*ones(length(x3),1);

y4 = [c2-1:-gap:c1+1];
y4 = reshape(y4,length(y4),1);
x4 = r1*ones(length(y4),1);

x = [x1;x2;x3;x4];
y = [y1;y2;y3;y4];
```