1. Write a MATLAB® script to determine whether or not a point robot in a 2D workspace, located at position \((x, y)\), collides with an obstacle of the following form:
   (i) circular obstacle, parameterized by a center \((x_1, y_1)\) and radius \(R\).
   (ii) rectangular obstacle described by coordinates of the four corners \((x_1, y_1); (x_2, y_1); (x_1, y_2); (x_2, y_2)\).
   (iii) triangular obstacle described by the three corners \((x_1, y_1); (x_2, y_2); (x_3, y_3)\).
   
   Hint. What is the set of points in the plane that satisfy \(ax + by + c \leq 0\)?

2. Write a MATLAB® script to predict the output of an ultrasonic array mounted on a point robot situated at \((0, 0)\). The various obstacles are given by:
   (i). circle of radius 5 centered at \((10, 10)\).
   (ii). rectangle given by \((-10, -5); (-10, 5); (-5, 5); (-5, -5)\)
   (iii) circle of radius 6 centered at \((0, -8)\).

   Plot the output for the cases of:
   (i) range is 3 units, range resolution is 0:25 and angular resolution is 5 degrees.
   (ii) range is 10 units, range resolution is 0:25 and angular resolution is 2:5 degrees.
   (iii) range is infinite, range resolution is 0:5 and angular resolution is 10 degrees.

   Hint. Use the saturated raw distance function. Do not assume pre-knowledge of obstacles by the robot.

3. Implement the Tangent Bug algorithm for a 2D point robot in a MATLAB® script. Produce robot trajectories in different scenarios for obstacles and goals.

   Hint: Use code from previous questions. Use rectangular and circular obstacles as primitives to build more complex scenarios.

Submit your zipped up solutions to mae.seto@dal.ca