Lab Six

ID1303: Introduction to Programming

1. (a) Write a structure called Point that can store the co-ordinates of a point in $\mathbb{R}^2$.

   (b) Do any two of the following:

   (i) Write a structure called Line that can store the equation of a line in $\mathbb{R}^2$. Write a function that accepts two struct Points as input and returns the Line joining them. If the two Points are identical, then the function may return any Line through the point.

   (ii) Write a structure called Triangle with three Points as vertices. Write a function that accepts a Triangle as input and returns its area.

   (iii) Write a structure called Circle which stores a Point as center and radius. Write a function that accepts two Circles and checks whether they intersect.

2. Write a recursive binary search function that searches for an element in an array in which elements are stored in increasing order.

3. Use binary search to write a function that accepts a positive real number x and a positve integer k and finds $\lfloor x^{1/k} \rfloor$. Here, $\lfloor y \rfloor$ is the floor function and is defined as the greatest integer less than or equal to y. For example, $\lfloor 100^{1/3} \rfloor = 4$.

4. Write a recursive function that uses the method of repeated squaring to find M^r modulo n, for a given 2 by 2 matrix M and positive integers r, n.