CMSC 10500-1: Homework 2

(due on Monday June 28th)

Consider the following scheme definitions for representing quadratic equations and their solutions:

```
;; structure representing the equation
;; quadratic*x^2 + linear*x + constant = 0
(define-struct quad-eqn (constant linear quadratic))

;; structure representing the roots of an equation
;; type is 'Degenerate 'Zero 'One 'Two
;; first and second are numbers
(define-struct quad-roots (type first second))
```

1. **(5 pts)** Write a function `solve` which takes as input a quadratic equation, represented by the `quad-eqn` structure, and returns the roots represented by the `quad-roots` structure.

   The `type` should be set to `'Degenerate`, `'Zero`, `'One` or `'Two` depending on whether the equation is degenerate and the number of real roots of the equation. If there are no real roots, `first` and `second` should both be set to zero. In case of one real root `second` should be set to zero. In the degenerate case, the linear term may assumed to be non-zero.

2. **(5 pts)** Write a function `equation` which takes an input a `quad-roots` structure and returns an equation (represented by a `quad-eqn` structure) whose roots is the given input. If the given input has type `'Zero`, then the equation returned should correspond to the quadratic equation: $x^2 + 1 = 0$.

3. **(10 pts)** Write a function `configuration`, which takes three points on the plane as input (each point represented by a `posn` structure) and returns one of the following:

   (a) `'CoLinear` if the three points are on a straight line.

   (b) `'RightTriangle` if the three points form a right angled triangle.

   (c) `'Neither` if none of the above two conditions hold.

   Hint: Calculate the pair-wise distances first.