MATHEMATICS ENRICHMENT CLUB.

## Senior Questions

1. Consider the quadratic equation

$$f(x) = x^2 - 2(c+1)x + c - 3;$$

where c is some real number. Let ; > 0, and suppose  $+\frac{1}{2}$  and 2  $\frac{1}{2}$  are the roots of f(x). Find all possible values for c

- 2. Let 4ABC be a triangle and X; Y; Z points on the sides BC; CA; ABrespectively. Suppose BX XC; CY YA; AZ ZB. Show that
  - (a) The area of 4XYZ is not less than one quarter of the area of 4ABC
  - (b) One of the corner triangles 4AZY;4BXZ;4CY Zhas area not greater than the area of 4XYZ.



- 3. Given that a; band care positive integers, nd the conditions for which the equation  $\vec{a} = \vec{b} = \vec{c}$  has a solution.
- 4. (bonus) In nitely many physicists walks into a pub. The rst physicist orders a beer, the second orders half a beer, the third a quarter, the fourth an 8<sup>th</sup> and so on. The bartender happens to be a math student, what would the bartender tell the physicists?