

**M10/11H Challenging 5 Assignment Quadratic Problems:**

1. Find all possible values of  $a/b$  if  $a^2 + 4b^2 = 4ab$
2. Let  $f(x) = a^2x^2 + 5ax + 3$  and  $f(2) = 2$ . Find all possible values of the constant "a"
3. Find the value of "x" if "x" is positive and  $x - 1$  is the reciprocal of  $x + \frac{1}{2}$
4. Let "f" be a function for which  $f(x/3) = x^2 + x + 1$ . Find the sum of all the values of "z" for which  $f(3z) = 7$  [amc12]

5. Let "a" and "b" be the roots of the equation  $x^2 - mx + 2 = 0$ . Suppose that  $a + \frac{1}{b}$  and  $b + \frac{1}{a}$  are the roots of the equation  $x^2 - px + q = 0$ . What is the value of "q"?

6. Find all real solutions to  $(x^2 - 5x + 5)^{x^2 - 9x + 20} = 1$

7. Find all solutions to the system of equations:

$$x^2 + yz = 39$$

$$x - yz = -33$$

$$y + z = 12$$

8. Find the roots of  $x^2 + \left(a - \frac{1}{a}\right)x - 1 = 0$  in terms of "a"

9. Find the solutions to  $(x^4 - 11x^3 + 24x^2) - (4x^2 - 44x + 96) = 0$

10. If  $\frac{x^2 - bx}{ax - c} = \frac{m - 1}{m + 1}$  has solutions for "x" such that each solution is the negative of the other, then find "m" in terms of "a" and "b". [AHSME]

11. Find constants "a" and "b" such that  $b - a$  is as small a possible, and the entire graph of the equation

$$y = \frac{1-x^2}{1+x^2} \text{ lies within } a < y \leq b$$

12. Prove that if  $\frac{a+b}{a} = \frac{b}{a+b}$  then "a" and "b" can't both be real numbers

13. Let "m" and "n" be the roots of  $ax^2 + bx + c = 0$ . Prove that if  $m^2 + n^2 = 1$ , then  $2ac = b^2 - a^2$