TY Hons Maths – Problem Set 4.

1. Factorise the following: (i) $6xy + 3x^2y - 9x^2y^3$ (ii) $4y^2 - 25z^2$ (iii) $6x^2 - 13x - 5$ (iv) $27x^3 + 8y^3$

2. Write down a quadratic whose roots are 4 and 3.

3. Find the real numbers a and b such that
$$x^2 + 8x + 7 = (x+a)^2 + b$$

4. Find the discriminant of the following equations and hence state the *nature* of their roots.

(*Nature* means whether they are real, equal or not real etc)

(i) $x^2 + 6x + 9 = 0$ (ii) $x^2 + 3x + 9 = 0$ (iii) $x^2 + 6x + 4 = 0$

5. Solve, without using a calculator, the following simultaneous equations:
$$y = x^2 - 6x + 15$$
$$2x - y + 3 = 0 \qquad \left[\text{Ans: } (2,7) \text{ and } (6,15)\right]$$

. In each of the following, express a in terms of the other variables.

6. (i) $y = 2a - x$ (ii) $y = \sqrt{a - x}$ (iii) $\dfrac{x}{y} = \dfrac{a+b}{a-b}$

7. (a) Expand the following (i) $(2x+5)^2$ (ii) $(ax+b)^2$

(b) If $9x^2 - 24x + p$ is a perfect square, find the value of p.

8. Simplify the following two algebraic expressions:

(i) $\dfrac{3x^2 - 16x + 5}{x^2 - 6x + 5}$ (ii) $\dfrac{1 + \dfrac{3}{x}}{2 - \dfrac{4}{3x}}$