

Due: Tuesday June 5, 5pm.

1. Find all binary quadratic forms with discriminant -163 . What is the smallest composite number represented by such a form? (Computerised search is acceptable for this question.)
2. Find all binary quadratic forms with discriminant -20 and classify the integers that can be represented by each form.
3. How many non-singular elliptic curves are there modulo 11? Count both the number of distinct equations and the number of distinct curves.
4. Consider the elliptic curve $y^2 = x^3 - 2$ modulo 5. List its points and describe the addition law.
5. Find the digit before the decimal point in the decimal expansion of $(\sqrt{2} + \sqrt{3})^{10000}$.
6. Find an infinite sequence of integer solutions to the equation $x^2 + y^2 + z^2 = 3xyz$.
7. Find all integer solutions of the equation $5x^3 + 11y^3 + 13z^3 = 0$.