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Daniel J Kriz* (dkriz@mit.edu), MIT Department of Mathematics, 77 Massachusetts Avenue, Cambridge, MA 02139. *Supersingular main conjectures, Sylvester's conjecture and Goldfeld's conjecture.*

In this talk, I formulate and prove a new Rubin-type Iwasawa main conjecture for imaginary quadratic fields in which p is inert or ramified, as well as a Perrin-Riou type Heegner point main conjecture for certain supersingular CM elliptic curves. These main conjectures and their proofs are related to p -adic L-functions that I have previously constructed, and have applications to two classical problems of arithmetic. First, I prove the 1879 conjecture of Sylvester stating that if $p = 4, 7, 8 \pmod{9}$, then $x^3 + y^3 = p$ has a solution with x, y rational numbers. Second, combined with previous Selmer distribution results, I show that 100% of squarefree $d = 5, 6, 7 \pmod{8}$ are congruent numbers, thus establishing Goldfeld's conjecture for the family $y^2 = x^3 - d^2x$, and solving the congruent number problem in 100% of cases. (Received January 14, 2020)