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Homework 3

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Homework 3-1

2.0/2.0 points (graded)

Fermat's Theorem on Sums of Two Squares is generalized into several directions. Fermat himself proved a prime number P is written as $P = X^2 + 3Y^2$ if and only if $P = 3$ or P is congruent to $1 \pmod 3$. Fill a positive integer in each blank.

$7 = A^2 + 3 \times B^2$

$31 = C^2 + 3 \times D^2$

$127 = E^2 + 3 \times F^2$

$A =$	$B =$	$C =$	$D =$	$E =$	$F =$
2	1	2	3	10	3
2	1	2	3	10	3

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Homework 3-2

2.0/2.0 points (graded)

Choose all the correct statements.

- [x] 83 is Quadratic Residue $\pmod{503}$.
- [ ] 83 is not Quadratic Residue $\pmod{503}$.
- [ ] 503 is Quadratic Residue $\pmod{83}$.
- [x] 503 is not Quadratic Residue $\pmod{83}$.

✔

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Homework 3-3

2.0/2.0 points (graded)

Let M be the number of lattice points with even X-coordinates in the interior of the triangle $(0,0)-(7,0)-(7,5)$. Let N be the number of lattice points in the interior of the triangle $(0,0)-(7/2,0)-(7/2,5/2)$.

Find M and N.

$M=$

7 ✔

7

$N=$

3 ✔

3

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Homework 3-4

2.0/2.0 points (graded)

The Quadratic Reciprocity Law established by Gauss was generalized to Class Field Theory by Weber, Hilbert, Takagi, and Artin by the beginning of the 20th century. Today, there is a program furthur generalizing Class Field Theory using modular forms and automorphic forms. It becomes one of the central problems in number theory. Wiles's solution of Fermat's Last Theorem is considered as a partial solution of it.

What is it?

- Lagrange’s program
- Lang’s program
- Langlands's program ✔
- Legendre’s program

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